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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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Environmental Health Service

NAPCA ABSTRACT BULLETIN

Vol. 2, No. 1

January 1971

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INTRODUCTION

This bulletin is published to inform NAPCA personnel and others of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, the NAPCA number, a bibliographic citation, and an abstract are given.

NAPCA personnel should direct requests for full text duplicates (if not locally available) to APTIC, 1033 Wade Avenue, Raleigh, North Carolina 27605, using the APTIC accession number. Translations of foreign language documents may be arranged upon request for NAPCA personnel only.

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As another service, abstracts of all the literature in APTIC (not just in a single issue of the NAPCA Abstract Bulletin) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of the NAPCA Abstract Bulletin because of the lapse time entailed by editorial, make-up, and printing work. For those who wish to browse through their own copies of each NAPCA Abstract Bulletin in a short period of time, subject and author are included in each issue.

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry —e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development, testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere. Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS—HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS—PLANTS AND LIVESTOCK

Effects on vegetation—crops, trees, other plants—and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS—MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes, public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

NAPCA ABSTRACT BULLETIN

I. EMISSION SOURCES

TRASH INCINERATION AND AGGLOMERATING PLANT IN BERLIN.

(Muellverbrennungs- und -sinteranlage in Berlin). Brennstoff-Waerme-Kraft, 16 (8):409, Aug. 1964. Translated from German. 1p.
Michael Ferber.
Identifiers: *Incineration, *Solid waste disposal, Concrete, Germany, Fly ash, Sludge.

An incineration plant for city trash and some industrial refuse, scheduled for completion in Berlin-Ruhleben in 1968, is described. The refuse, together with heating slag, fly ash from power plants, and sludge from a neighboring clarification plant are processed in an agglomerating belt installation into admixtures for concrete. Excess heat will be used for steam at 24 excess atm, 430 C for municipal heating purposes. When completed, a daily maximum of 2000 tons can be processed with a daily agglomerate production of about 1000 tons. This will correspond roughly to half the total trash output of the entire West Berlin metropolitan area. A population of 2.2 million, with an annual trash load of about 3.3 million cu m (about 870,000 tons), is projected after 1972.
APTIC-11971

WHAT DOES IT COST TO DESULFURIZE FUEL OIL.

For primary bibliographic entry see Field 02.
APTIC-18191

VEHICLE CHARACTERISTICS OF FUEL AND TRAVEL TIME ON URBAN ARTERIALS AND FREEWAYS.

Washington Univ., Seattle, Contract Y-1142, RR-14A, 44p., Jan. 1970. 8 refs. CFSTI: PB 190538
Roy B. Sawhill, James H. Matteson, and Jerome W. Hall.
Identifiers: *Highways, *Operating variables, *Vehicles, Costs, Urban areas, Gasolines, Diesel engines.

The impact of urban freeways on vehicle operating characteristics of travel time and fuel consumption is evaluated. A comprehensive, long-term 'before and after' study is discussed. Travel time and fuel consumption data were collected for five classifications of vehicles operating over four parallel arterial routes as well as on the freeway. On only two of the parallel routes was there a statistically significant reduction in traffic volume with a corresponding saving in travel time. The total time savings benefit for 1968 as a result of the freeway was \$30,737,000 or about 12% of the construction costs. Statistically significant fuel savings were observed for the passenger car on two of the secondary routes but not on the major parallel route, even though a time savings was experienced. The total system fuel savings is \$366,000 for 1968. Approximately 25% of this benefit is attributable to diesel-powered vehicles. (Author abstract modified)
APTIC-19040

A REVIEW OF AIR POLLUTION PROBLEMS AND CONTROL IN THE CERAMIC INDUSTRIES.

For primary bibliographic entry see Field 02.
APTIC-19177

ATMOSPHERIC SAMPLING STUDY OF NF ROCKET PROPELLANT, REDSTONE ARSENAL, HUNTSVILLE, ALABAMA, 26 MAY-16 JUNE 1969.

Army Environmental Hygiene Agency, Edgewood Arsenal, Md., Rept. 99-003-69/70, 32p., Nov. 14, 1969. 2 refs. CFSTI, DDC: AD 699360
Howard A. Wiener, Robert P. Bartell, Thomas L. Hess, and Kenneth N. Ports.
Identifiers: *Fuels, *Missiles and rockets, Air quality measurements, Fluorides, Fluorine.

A field study was conducted at Redstone Arsenal, Huntsville, Alabama to measure the concentration of and determine areas of exposure to total fluorides in the exhaust cloud of statically fired six pound motors utilizing a developmental NF propellant. Results of the study gave strong indications that only areas exposed to the visible exhaust would be contaminated by fluorides. The study results also indicated that all fluorides in the exhaust were predominantly in the gaseous state. Areas of greatest exhaust cloud total fluoride concentration were found to be at the approximate location where the cloud was initially formed. In the firing tests conducted, exposure to the cloud at any point within its path was determined to be less than one minute in all cases observed. It was estimated that areas at distances greater than 150 meters from the firing point of the six-pound motors would not be significantly exposed to fluorides from the exhaust. (Author abstract)
APTIC-19400

AN IMPROVED EXPLODING WIRE AEROSOL GENERATOR.

Preprint, Minnesota Univ., Minneapolis, 6p., 1969 (?) 9 refs.
M. Tomiades, and K. T. Whitty.
Identifiers: *Aerosol generators, Aerosols, Particle size, Design criteria.

An exploding wire-type aerosol generator, improved to provide safe and automated operation, is described. Design characteristics of the unit are included. The aerosol generated by the unit was evaluated by the use of electron microscopy. Studies were made to estimate the influence of discharge voltage, amount of stored energy, fixed electrode polarity, wire material, and method of sampling on the quantity of aerosol and shape of the aerosol particles. Size distribution can be expressed, on the average, by number median diameter of 0.03 micron and geometric standard deviation of 2.0. Schematic diagrams of the aerosol source and electric circuit are included.
APTIC-19409

ORGANIC ELECTROLYTE BATTERIES.

For primary bibliographic entry see Field 02.
APTIC-19447

POLLUTION OF ATMOSPHERIC AIR IN THE VICINITY OF CHIMNEY GAS AND HOT AIR OVEN SOOT PRODUCING PLANTS.

U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 8:191-194, 1963. (B. S. Levine, ed.) CFSTI: 63-11570
N. P. Gordynya.

Identifiers: *Soot, *Carbon monoxide, *Soot-producing plants, USSR, Industrial emission sources, Air quality measurements, Benzo (3-4)pyrene.

The two principle pollutants found in emissions from a soot-producing plant were soot and carbon monoxide; after passing through electrostatic precipitators, the gases from soot ovens had a soot content of 3-5% and a CO concentration of 8.1%. Air quality measurements made up to 4000 m from the plant showed that soot pollutes the atmosphere within a radius of 4 km; all samples collected up to 1 km from the plant contained soot in excess of the allowable limit of concentration in ambient air. Air pollution from CO extended over a radius of 1 km from the plant, with the highest concentration at a distance of 500 m. Soot produced from both chimney gas ovens and hot air ovens was analyzed for 3,4-benzpyrene content by the fluorescent fineline method; a content of 0.003% was found in chimney gas soot, while none was found in hot oven soot. These findings are now being tested in animal experiments. Tree and shrub leaves were coated with soot at distances of 2-3 km from the soot plant. Answers to a questionnaire complained of many unfavorable effects of soot pollution on living conditions and community health at distances over 4 km from the plant.
APTIC-20375

HERE'S WHAT IS KNOWN ABOUT LIQUID GAS PIPELINES.

For primary bibliographic entry see Field 02.
APTIC-20382

CONSTRUCTION AND OPERATION OF FIRST MIDWESTERN LNG PEAK SHAVING PLANT.

For primary bibliographic entry see Field 02.
APTIC-20383

THE OUTBOARD MOTOR AND WATER POLLUTION.

(Der Aussenbordmotorbetrieb und die Gewaesserverschmutzung). Motortech. Z. (Stuttgart), 29 (3):85-90, March 1968. 8 refs.
Translated from German. 25p., Sept. 23, 1969.
W. Pflaum, Th. Kempf, and D. Luedemann.
Identifiers: *Water pollution, *Outboard motors, Germany, Engine exhausts, Fuel oils, Operating variables, Power sources, Hydrocarbons.

Braking tests, as well as tank and pond experiments, were conducted on mixture-lubricated, two-stroke outboard motors to determine exhaust gas substances which condense in or are absorbed by water. The most disturbing components of the exhaust gas are the heavy hydrocarbons. Their effects and those of other components on underwater plants and animals were studied by chemical and biological tests and by taste checks of fish. The motor tests were performed with new motors or motors past the break-in period. They had nominal powers of 6, 18, and 40 HP and were operated with fuel-to-oil mixtures of 1/25, 1/50, and 1/100. After 350 hours, as a consequence of wear and tear, medium power class motors consumed 10-25% more fuel and emitted more toxic substances. The average data double at idle or full load operations. Any improvement of the motors which leads to a lower fuel and oil consumption would reduce the emission of pollutants to water. Results show that the permissible fuel-to-water ratio should be changed from 1/100,000 to 1/200,000.
APTIC-20384

THE SENSITIVE MEASUREMENT OF BAD ODOR IN USING OF AN ODORLESS CHAMBER.

(Mooshushitsoohoh ni yoloo shuki kannoh sokootei (II). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4 (1):115, 1969. 2 refs. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)
Y. Hamanabe, S. Harima, T. Miura, T. Doman, and T. Namiki.

Identifiers: *Odors, Thresholds, Japan, Odorimetry, Ammonia, Mercaptans, Sulfides.

The odor of methyl-mercaptan, ammonia, and dimethyl sulfide was measured using an odorless chamber from whose windows odor was sniffed by a panel of 5-6 members on the threshold level, environmental level, and nuisance level of malodor. The first level means the minimum one, when the odor starts to smell; the second one does not give any actual effects on the body; and the last one results in headache, nausea, reduced appetite, etc. The results in ppm for threshold level, environmental level and nuisance level, respectively, are as follows: methyl mercaptan: 0.0001, 0.02, and 1.0; ammonia: 0.04, 8.0, and 40; and dimethyl sulfide: 0.01, 2.0, and 10. Although the comparison is made between these individual odors and mixed odors, it is difficult to know their relationship.
APTIC-21857

REDUCTION OF EMISSIONS AT REFUSE INCINERATORS.

For primary bibliographic entry see Field 02.
APTIC-21882

UNDERGROUND STORAGE OF LIQUEFIED NATURAL GAS: FIRST STUDIES AND PROJECTS OF GAZ DE FRANCE.

For primary bibliographic entry see Field 02.
APTIC-22117

CONTROL OF EXHAUST GAS FROM INTERNAL COMBUSTION ENGINE.

For primary bibliographic entry see Field 02.
APTIC-22129

ISOGO INCINERATION PLANT IN YOKOHAMA.

For primary bibliographic entry see Field 02.
APTIC-22130

ANALYSIS OF THE TRACE OF ORGANIC PRODUCTS IN FUEL COMBUSTION FUMES.

For primary bibliographic entry see Field 03.
APTIC-22144

AIR POLLUTANT EMISSIONS FROM PLASTICS MANUFACTORIES.

(Gohsei jushi kakoh kohoh no hai gas yugai seibon chohsa (Dai 2 hoh)). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4 (1):84, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.) T. Hasegawa, H. Yoshikawa, S. Iwasaki, K. Shima, and T. Shono. Identifiers: *Plastics, *Benzopyrenes, Leather, Japan, Chemical processing.

A survey of emissions of waste gas from plasticizers used in vinyl chloride processing factories was performed in Osaka, by using gas chromatography. In a mixing roll in the mixing process of sheeting works, DIBP (43.1 to 61.6 mg/cu m) and DBP (22.4 to 38.5 mg/cu m) are found through sampling with a large bubbler containing toluene, and DIBP (26.3 to 42.1 mg/cu m) and DBP (22.4 to 38.5 mg/cu m) through sampling with a large impinger with water. A high-volume air sampler has a better performance than these two samplers. For a foaming process of vinyl leather factories, measurements are done through sampling with a large bubbler with toluene at two works, one which does not have any control measures and the other which has washers. The result are as follows: DIBP, 59.8 to 100 mg/cu m and DBP, 230.0 to 458.0 mg/cu m for the first factory; DBP, 92.4 to 125.2 mg/cu m and DOP, 84.6 to 91.1 mg/cu m at the exit of the foamer, DBP, 75.3 to 76.4 mg/cu m and DOP, 47.9 to 54.7 mg/cu m after a shower washer and DBP, 35.5 mg/cu m and DOP, 16.0 mg/cu m after a venturi washer in the second factory.
APTIC-22145

ODOROUS SOURCES IN KRAFT PULP MILLS.

(KP kohoh chu no akooshu haseigen ni tsuite). Text in Japanese. Taiki osen Kenkyu (J. Japan Soc. Air Pollution), 4 (1):149, 1969. (Proceedings of The Japan Society of Air Pollution Annual Meeting, 10th, 1969.) T. Kikuchi, H. Funaki, S. Sato, and K. Saito. Identifiers: *Kraft pulping, *Sulfur compounds, Japan, Gas chromatography, Mercaptans, Sulfides, Hydrogen sulfide.

In a pulp mill in Miyagi Prefecture which manufactures bleached kraft pulp at 430 ton per day, malodorous substances, mainly volatile organic compounds, are analyzed qualitatively and quantitatively by means of gas chromatography after collecting and concentrating samples by acetone at a temperature of -78°C at several points in the process. At a recovery furnace of the recovery process, methyl mercaptan (1.22 to 4.04 ppm), dimethyl sulfide (0.84 to 1.80 ppm) and hydrogen sulfide (236 to 346 ppm) are detected. In the digestion process, dimethyl sulfide (263 to 280 ppm) in the exhaust exit of a blow tank and methyl mercaptan (11,560 to 14,125 ppm) and dimethyl sulfide (9880 to 14,100 ppm) in exhaust exit of the

'tarpetin' tank are found. From this analysis, the gases from the latter process seem to pollute the air around the mill.
APTIC-22148

COOLING TOWER SITE CONSIDERATION.

For primary bibliographic entry see Field 02.
APTIC-22159

ORGANOCHLORINE PESTICIDES IN RAIN-WATER IN THE BRITISH ISLES.

Nature, vol. 219:725-727, Aug. 17, 1968. 12 refs. K. R. Tarrant, and J. O'G. Tatton. Identifiers: *Great Britain, *Pesticides, *Rain, *Chlorinated hydrocarbons, Annual, London, Urban areas.

Rainwater was collected continuously during 12 months at seven widely distributed sites in the British Isles; the samples, after extraction with hexane, were analyzed for organochlorine pesticides by thin-layer chromatography. The tabulated results, expressed in parts/10 to the 12th power of the rainwater collected, show the pesticide residues collected in each quarter of the year and the mean value for the whole year for the individual sites. Throughout the year, rainwater at all sites contained alpha-BHC, gamma-BHC, dieldrin, pp-DDT and its two primary toxic metabolites: pp-DDE and pp-TDE. The concentrations of the individual compounds were of the order of parts/10 to the 11th power or parts/10 to the 10th power. Comparison with earlier reports indicates that the general concentrations in London and one small rural town are lower than they had been. The lower concentrations may be due to the progressive reduction in atmospheric pollution in London and to the abandonment of large-scale uses of particular pesticides. However, usage and conditions in an individual country are unlikely to make large differences in the world-wide distribution of the pesticides because of the ability of winds and ocean currents to distribute the compounds over wide areas.
APTIC-22350

NEW CONCEPTS OF REFINERY WASTE TREATMENT.

For primary bibliographic entry see Field 02.
APTIC-22356

NATURAL AEROSOL IN CLEAN AND IN POLLUTED AIR.

(Das natuerliche Aerosol in reiner und verunreinigter Luft). Text in German. Schriftenreihe Ver. Wasser Boden Luft/hyg. (Berlin), no. 30:13-18, 1970. 14 refs. H. W. Georgii. Identifiers: *Aerosols, *Sources, *Altitude, Germany, Oceans, Plains, Volcanoes, Industrial emission sources, Non-industrial emission sources, Lower atmosphere, Middle atmosphere, Upper atmosphere, Topographic interactions, Nucleation.

The anthropogenic, industrial, and radioactive concentration of gaseous and particulate trace elements in the atmosphere exceeds that of aerosol by one order of magnitude. A characteristic difference exists between the nature and composition of continental and maritime aerosols. Terrestrial sources of aerosol are volcanoes, forest fires, desert dust, anthropogenic, and industrial emissions; a negligible cosmic source is dust from meteorites. In the northern hemisphere, industrial sources account for 30% of the aerosol components. Salt nuclei from the sea account for one fourth to one fifth of the nuclei which are instrumental in cloud formation. The number of giant maritime nuclei exceeds that of giant terrestrial nuclei; their concentration in the troposphere decreases exponentially with altitude. While the number of Aitken's nuclei within the stratosphere decreases to a count of 10 per cu m, large nuclei manifest an increasing tendency at an altitude of 18 to 20 km. The effect of industrial emission

such as SO₂ over industrial areas is clearly measurable to an altitude of 700 m; beyond that, local differences disappear. In central Europe, a natural background aerosol no longer exists; it has been obliterated by numerous anthropogenic processes and differs widely from natural aerosols of uninhabited parts of Asia, Australia and North America.
APTIC-22362

EXHAUST HYDROCARBON COMPOSITION. ITS RELATION TO GASOLINE COMPOSITION.

American Petroleum Inst., New York, Div. of Refining, Proc. Am. Petrol. Inst., Sect. III, vol. 50:514-543, 1970. 12 refs. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 35th, Houston, Tex., May 13-15, 1970.) K. T. Dishart. Identifiers: *Hydrocarbons, *Engine exhausts, *Gasolines, Automobiles, Chemical composition, Air-fuel ratio, Engine design modification, Fuel additives, Ethylene, Toluene, Xylenes, Tetraethyl lead.

The influence of changes in hydrocarbon composition of leaded gasolines on the individual hydrocarbons found in the exhaust of vehicles equipped with various types of emission control systems is determined. Changes in gasoline olefin content have little effect on the amounts of the predominant olefins in the exhaust—ethylene, propylene and isomeric butylenes. Increases in gasoline aromatic content increases the amounts of the predominant aromatic compounds found in the exhaust—toluene, meta and para xylene—but decreases the amounts of predominant exhaust olefins. The source of the ethylene, propylene, and butylenes is attributed to the high octane alkylate components which, in leaded gasolines, decrease as the fuel aromatic content increases. While the type of emission control device affects the level of hydrocarbons in the exhaust, the relative amounts of individual hydrocarbons remain fairly constant, except with an exhaust manifold thermal reactor control system which markedly reduces the proportion of the 'reactive' hydrocarbons as well as markedly reducing the total hydrocarbons in the exhaust. Leaded premium grade gasolines with similar octane quality and volatility characteristics are used. The aromatic and olefin contents of these gasolines covers the usual range found in today's commercial premium gasolines. The vehicles in which these fuels are tested are equipped with different types of emission control systems. These include the conventional air injection and engine modification systems, and a Du Pont exhaust manifold reactor system capable of very low exhaust emission levels. Also included is a car without a control system. (Author abstract modified)
APTIC-22414

INFLUENCE OF THE STRUCTURE OF ENERGY CARRIER'S CONSUMPTION ON AIR POLLUTION.

(Az energiahordozo struktura valtozasanak hatasa a levegoszennyezettsegre). Text in Hungarian. Energia Atomtech. (Budapest), 23 (5):203-207, 1970.

Istvan Hasz. Identifiers: *Trends, *Fuels, Europe, Fly ash, Coal, Coke, Fuel gases, Fuel oils, Electric power production, Domestic heating, Hydrocarbons, Sulfur dioxide.

In addition to meteorological and geographical conditions and the conditions imposed by urban planning, the greatest influence on air pollution comes from the quantity and quality of the fuels consumed in a given area. From an air pollution point of view, natural gas is the most desirable fuel; city gas is next, followed by sulfurless oils; other kinds of oils are next, followed by coke. The least desirable fuel is coal. The above ranking is based on the quantity of pollutants liberated from

the different fuels while generating 1 times 10 to the 6th power Kcal useable heat. A dramatic change took place on a world-wide scale between 1950 and 1966, in the relative contribution to energy supply, of petroleum and coal: hydrocarbons increased from 34% to 54% and coal decreased from 59% to 39%. There are several technological-economical reasons for the increase in the use of hydrocarbon fuels, but air pollution considerations became lately quite powerful. As a consequence, Western European countries were forced to import a growing percentage of their energy carriers. The Hungarian coal reserves are small (good for 80-100 years) and expensive to use, but inadequate knowledge about the domestic oil reserves misdirected the Hungarian power industry towards the use of coal in the 1950's. This caused a significant increase in urban air pollution. Petroleum discoveries and better international cooperation during the second and third 5 year plan shifted the balance and new customers of energy rely exclusively on gas and oil. By 1980, coal will decrease from 72% in '60 to 26-29%; hydrocarbons will increase from 21% to 62%. Some imported electricity from the Soviet Union will be even used for heating in crowded cities. By 1970, the private (heating) use of coal will be largely eliminated by district-heating and conversion to oil and LPG (liquid petroleum gas). The substituted coal amounts to 10 times 10 to the 6th power t/year. Therefore, sulfur emission in Budapest will decrease by 57% from 1965 to 1980 and ash production by 81%.

APTIC-22418

PESTICIDE DRIFT FROM AERIAL AND GROUND APPLICATIONS.

Ag. Eng., 51 (8):460-464, Aug. 1970. 8 refs.

K. R. Frost, and G. W. Ware.

Identifiers: *Transport, *Pesticides, *Crop spraying, Diurnal, Alfalfa, Mists, Aircraft, Sampling methods, Ground level, Lower atmosphere, Winds, Inversion, Chlorinated hydrocarbons.

Pesticide drift was compared for various methods of application, weather conditions, and locations, in four field experiments. Glass plates, alfalfa samples, and Andersen Air Samplers were used to collect the drift. A Marlow Econ-O-Mist tractor-drawn mist blower was employed for the ground application, in which 1.5 lb of methoxychlor in 3 gal of spray was applied in a swath width of 35 ft per acre; a Piper Pawnee monoplane equipped with 56 nozzles applied 1.5 lb of methoxychlor in 7 gal of spray per acre at 80 mph with a swath width of 50 ft. Under these conditions, an aerial application gave less drift downwind than the comparable mist-blower application to 1/2 mile from target. When the mist blower was operated at 2 mph, applying 3 gal per acre, and an eight-row sprayer was operated at 4 mph to apply 14 gal per acre of liquid and 1.5 lb methoxychlor, the drift was four to ten times greater from the mist blower than from high clearance sprayer to 1320 ft. Morning and afternoon applications by airplane indicated slightly more drift for the evening application except at the 1320 ft station. Under 5 mph wind velocity, wind and inversion temperature had little influence on drift from high clearance sprayer application. High inversion temperature caused greater drift in aerial applications. Deposits on glass plates with ground application were considerably less with a larger nozzle. Both methods of drift measurement were used in a number of tests in an attempt to determine the relationship micrograms collected at each station and the parts per million residue on dry alfalfa at the same location. The equation $\log P = 1.36 + 0.84 \log M$, when M equals the micrograms collected on the plates and P the parts per million residue on alfalfa, indicates that tests could be simplified by measuring the micrograms per 500 sq cm and obtaining the parts per million residue from the regression line.

APTIC-22524

THE FLUORIDE PROBLEM.

Preprint, Ontario Dept. of Energy and Resources Management, Toronto, Air Management Branch; Air Pollution Control Assoc., Pittsburgh, Pa., TR-7 Agricultural Committee; and Air Pollution Control Assoc., Toronto, Ontario, Ontario Section, 13p., 1970. 3 refs. (Presented at the Proceedings on the Impact of Air Pollution on Vegetation, Toronto, Ontario, April 7-9, 1970, Paper 12856.)

E. R. Hendrickson.

Identifiers: *Fluorides, Regulations, Air quality standards, Combustion gases, Particulates, Chemical processing, Fertilizer manufacturing, Primary metallurgical processing, Scrubbers.

Fluorine is discussed in terms of kinds of compounds, sources, control procedures, and regulations in various parts of the United States. The majority of problems relating to fluorides in the atmosphere involve vegetation, animals through ingestion of vegetation, and materials. Fluorides may be discharged into the atmosphere by combustion of coal, the production of phosphate chemicals and fertilizers, and by several other metallurgical manufacturing processes. The processing of phosphate rock contributes a substantial portion of the total fluoride contamination. Most of the reactive fluorides are readily absorbed in conventional scrubbing systems. Regulations and air quality standards relating to fluoride gases and particulates are discussed.

APTIC-22547

CHANGING PRACTICES IN AGRICULTURE AND THEIR EFFECT ON THE ENVIRONMENT.

CRC Critical Rev. Environ. Control, 1 (1):69-99, Feb. 1970. 67 refs.

Raymond C. Loehr, and Samuel A. Hart.

Identifiers: *Animals, *Organic wastes, *Odors, Farms, Microorganisms, Non-industrial emission sources, Feed lots, Fertilizing, Water pollution, Control methods.

Animal production is discussed in terms of productivity increases, changes in size of operations, handling problems, waste characteristics, surface and ground water quality, land application of wastes, land runoff, odor production, and waste management techniques. Confinement feeding of livestock and increased numbers of animals per production unit have created large volumes of wastes with low value and societal and/or economic restrictions that limit the feasibility of recycling animal wastes through the soil environment. Animal wastes may contribute to water pollution in many ways: such as: excessive nutrients that unbalance natural ecological systems and increase eutrophication; microorganisms that may impair the use of surface waters for recreational use; impurities in ground water; contaminants that complicate water treatment; and depletion of dissolved oxygen, causing fish kills. While odors can be reduced by proper sanitation in production facilities and by proper treatment facilities, odor control is both difficult and costly. Pollution characteristics of animal wastes are presented tabularly. Handling and storage techniques are discussed, as well as water problems and land disposal. Agricultural runoff is the major source of nutrient and silt pollution to Lake Erie; increasingly larger quantities of nitrogen and phosphorus fertilizers are being applied to the land and find their way to the lake during runoff. Odor and dust production and control are discussed in detail, as well as site selection of agricultural operations.

APTIC-22550

EFFECTS OF TOLUENE CONTENT IN FUEL ON AROMATIC EMISSIONS IN THE EXHAUST.

For primary bibliographic entry see Field 02.

APTIC-22627

INCINERATOR EMISSION CONTROL.

For primary bibliographic entry see Field 02.

APTIC-22642

MHD: THE POWER GENERATION PROGRAM FOR ENVIRONMENTAL CONTROL.

For primary bibliographic entry see Field 02.

APTIC-22649

UNDERGROUND RESERVOIRS IN FRANCE.

For primary bibliographic entry see Field 02.

APTIC-22690

LEAD REMOVAL FROM GASOLINE NOT YET CERTAIN—OTHER POLLUTION FACTORS TO BE CONSIDERED.

For primary bibliographic entry see Field 02.

APTIC-22825

THE EFFECT OF OSCILLATORY COMBUSTION ON THE FORMATION OF ATMOSPHERIC POLLUTANTS.

Combust. Flame, 14 (3):325-339, June 1970. 44 refs.

Arthur W. Opsahl, and Richard C. Seagrave.

Identifiers: *Smog, *Gas sampling, *Combustion, *Pressure, *Temperature, Engine exhausts, Mathematical analyses, Hydrocarbons, Methanes, Hydrogen, Hydroxides, Carbon monoxide, Nitrogen dioxide (no2), Oxygen, Heat transfer, Reaction kinetics, Thermodynamics.

Approximate integration techniques were employed to solve the set of simultaneous kinetic rate equations which describe the oscillatory combustion of certain hydrocarbons; dynamic concentrations for each chemical species were calculated as a function of time and position in a model flow combustor. Three chemical systems were investigated: the combustion of carbon monoxide in oxygen, the combustion of carbon monoxide in air, and the products of the combustion of methane in air. Calculations of the point-to-point equilibrium concentrations for the chemical systems investigated were made for comparison. Deviation from equilibrium in flow combustors is very significant for important trace components which apparently play key roles in the formation of atmospheric pollutants and urban smog. The very steep longitudinal concentration profiles which occur in externally cooled combustors make valid interpretation of the sampling of combustion gases very difficult. Pressure-temperature oscillations in the flame increase the concentration of certain chemical species such as H₂, OH, and NO₂, whereas the concentration of others (e.g., oxygen) is decreased. Exit temperature seems to control the concentration of most of the significant components, since higher exhaust temperatures increase the effects of the oscillations. Although viscous dissipation induced by high-frequency pressure oscillations might have a significant effect on the local temperature and thus increase the enhancement of certain products due to the oscillations, its estimated effect in the systems investigated was negligible. (Author abstract modified)

APTIC-22835

SOME REMARKS ON AIR POLLUTION BY MOTOR EXHAUST AND OTHER COMBUSTION PRODUCTS.

Eng. J. (Toronto), 53 (7):4-10, July 1970. 27 refs.

Boleslaw Szczeniowski.

Identifiers: *Engine exhausts, *Combustion products, *Air-fuel ratio, Proposals, Education, Legislation, Standards, Cancer, Asthma, Bronchitis, Emphysema, Canada, Internal combustion engines, Engine design modification, Fuel additives, Ethyl alcohol, Hydrogen, Carbon monoxide, Combustion, Temperature.

No mechanical device or addition of any chemical compound can improve combustion if it does not supply the oxygen that is lacking or does not reduce fuel excess. Very high maximum temperatures are attained during combustion in a gasoline

engine at full throttle with stoichiometric mixture and the phenomenon called dissociation is then unavoidable, even theoretically. To have nearly perfect combustion, a nearly perfect homogeneity of fuel-air mixture is required and this is possible only if all fuel droplets vaporize before combustion starts. In the conditions usually prevailing in gasoline engines, only some 60-65% of the fuel is vaporized. An adequate heat supply for vaporization, while improving combustion, reduces the maximum obtainable engine torque by 4 to 6%, thus moving advertising claims to some degree. Tests are reported to emphasize the sensitivity of carbon monoxide formation to the slightest change in the air and/or fuel excess. It is suggested that the carburetor ought to be redesigned according to strict new standards enforced by law, in such a manner as to make impossible its resetting to deliver more than, say, 0.4% CO in the exhaust under any conditions, including acceleration, except during cold engine startings. A 10% addition of ethanol increases the air excess from 0 to 4% without touching the carburetor. Propane, butane, hydrogen, and diesel fuels are also mentioned, as well as electric and steam powered vehicles. Manufacturing and use of small, less powerful cars should be encouraged and their use perhaps imposed by legislation in downtown areas. The increase of public transit in cities, then in the suburbs and eventually over longer distances ought to be a matter of national policy. Creation of schools, perhaps compulsory, for motorist, and teaching how to drive pollution-free should become a national goal. The relative harmfulness of carbon monoxide and other pollutants is indicated.

APTIC-22836

ATMOSPHERIC EMISSIONS FROM WET-PROCESS PHOSPHORIC ACID MANUFACTURE.

For primary bibliographic entry see Field 02.
APTIC-22913

WHY ENGINE VARIABLES AFFECT EXHAUST HYDROCARBON EMISSION.

Preprint, Society of Automotive Engineers, Inc., New York, 25p., 1970. 20 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 12-16, 1970, Paper 700108.)

Wayne A. Daniel.

Identifiers: *Engine exhausts, *Operating variables, *Hydrocarbons, Internal combustion engines, Mathematical modeling, Oxidation.

The relative importance of several internal environmental factors known to affect the hydrocarbons exhausted by an engine is studied using an analytical model of the emission process. The model includes two sources of unburned fuel resulting from wall quenching of the flame, 1) the walls of the open part of the chamber, and 2) the crevices separated from the open part of the chamber by restrictive passages; and three subsequent effects, 1) the oxidation of unburned fuel in the chamber after flame propagation, 2) the preferential exhausting of the burned products from the chamber and 3) the oxidation of unburned fuel in the exhaust system. Results obtained by empirically fitting the model to measured exhaust hydrocarbon concentrations for systematic changes in five operating variables indicate that different environmental factors predominate in causing the different variable effects. (Author abstract modified)

APTIC-22936

AN EXPERIMENTAL BATTERY POWERED FORD CORTINA ESTATE CAR.

For primary bibliographic entry see Field 02.
APTIC-22938

NATURAL GAS FUELED VEHICLES EXHAUST EMISSIONS AND OPERATIONAL CHARACTERISTICS.

For primary bibliographic entry see Field 02.

APTIC-22941

SOME FACTORS TO CONSIDER IN THE DESIGN AND APPLICATION OF AUTOMOTIVE IGNITION SYSTEMS.

For primary bibliographic entry see Field 02.

APTIC-22944

THE FIRST YEAR'S EXPERIENCE OF THE ALAGASCO LNG PLANT.

For primary bibliographic entry see Field 02.

APTIC-22947

INVESTIGATING SOME OF THE PROPERTIES OF OIL ASH DEPOSITS.

Teploenergetika, 16 (2):62-66, 1969. 3 refs.

V. P. Ivanov, and I. I. Chudnovskaya.

Identifiers: *Deposition, *Ashes, *Boilers, Vanadium, USSR, Colorimetry, Samplers, Source sampling, Calcium compounds, Sodium compounds, Crystal structure, Density, Temperature.

Intensive fouling of convective superheater heating surfaces for a large-capacity gas/oil fired boiler was investigated by examining the ash deposits formed on the heating surfaces. The device used for this purpose was a specially designed sampler-calorimeter which simulates the heating surfaces. The sampler was installed near the pendent superheater at a point where the gas temperature was 1100 - 900 C. and the test lasted 1 - 10 hrs. The intensity of fouling and the structure of the deposits depended largely on wall temperature, and the amount of ash deposits increased perceptively over the period of 5 to 10 hrs. Thermal conductivity coefficients were calculated for specimens of deposits, and the graphical analyses of the data showed that the differences in the structure of the layers contribute to the different coefficients of thermal conductivity. Porosity, crystal structure and size, and volumetric density were some of the factors causing the difference in the coefficients.

APTIC-22955

PERSISTENT PESTICIDES IN THE ENVIRONMENT.

CRC Critical Rev. Environ. Control, 1 (1):7-67, Feb. 1970. 297 refs.

Clive A. Edwards.

Identifiers: *Pesticides, Abatement, Federal governments, Standards, Animals, Humans, ops, Plant damage, Liver, Tissues, Retention, Health impairment, Great Britain, Dusts, Crop spraying, Pest control, Gas chromatography, Transport, Winds, Rain, Chlorinated hydrocarbons, Liquids, Vapors.

The persistence of pesticides in the environment is reviewed. Prior to the development of gas-liquid chromatography, analysis of air and water-borne pesticide required extremely sensitive analytic techniques. Now, it is possible to differentiate between the vapor and the dust-borne phases in the air and, more commonly, in rainwater. Two principal mechanisms of pesticide air pollution are established: windborne dust for which chlorinated hydrocarbons have an affinity, and co-distillation from the surface of treated soils. The former appears to be the dominant mechanism. Since urban areas use approximately 1/3 of the total chlorinated hydrocarbons used in control of mosquitoes and other pests, the problem cannot be categorized as a rural one. DDT is the principal pesticide used in urban areas. Because of their relatively low solubility, chlorinated hydrocarbons have a tendency to concentrate in the bottom sediment of streams and lakes. There is evidence to indicate that insecticides kill large numbers of insects that provide food for fish and, more important, insects that help keep the water non-stagnant by feeding on the plankton and algae. Of particular significance is the fact that aquatic vertebrates tend to concentrate insecticides in their systems, maintaining a higher level than that of their environment. Concentration factors for various insecticides in differing species of fish of 400 are

common, and in one instance, a concentration factor of 70,000 was observed for the insecticide Endrin. This relates to chlorinated hydrocarbons in the birds in that while insecticide poisoning of birds have been established as a result of seed and fruit treatment, by far the largest single group effected are fish-eating varieties, with insect eating varieties second. Principal concentrations of DDT are most commonly located in fatty tissue and the liver. Pesticides in excess may also damage crops, irrespective of whether they are applied to the soil or the foliage. In the United States, legal tolerances have been fixed for permissible amounts of residue that may occur in plant tissues that are used for human foods. While the amount of DDT in human tissue greatly exceeds that of all other chlorinated hydrocarbons, many insecticide residues are very common in human bodies from all parts of the world that have provided data. Control of pesticides is discussed with consideration being given to intelligent use, regulated use, prohibition, and substitution.

APTIC-22970

INTRODUCTION TO AIR QUALITY CONTROL.

Pacer, I (5):1-14, 1970.

Robert M. Jensen.

Identifiers: *Pollutants, *Sources, Economic losses, Cattle, Plant damage, Lung cancer, Fluorosis, Bronchitis, Materials deterioration, Corrosion, Non-urban areas, Urban areas, Odors, Industrial emission sources, Chemical processing, Rendering, Transportation, Fluorine compounds, Carbon monoxide, Sulfur dioxide.

The hazard of and the harm caused by air pollution depend upon concentration and exposure. As can be demonstrated statistically, the incidence of health hazards due to air pollution is about 100 times greater in a city than in a rural area. Transportation contributes nearly 60% of the total atmospheric pollution and yields 74,800,000 tons of pollutants per year; manufacturing is the next biggest producer at 23,400,000 tons per year. The biggest single pollutant is the 65,000,000 tons of deadly carbon monoxide which we pump into our atmosphere each year. There is a large and rapidly increasing amount of evidence which relates air pollution to chronic bronchitis and respiratory cancer. Air pollution damages crops, livestock, shrubbery, and trees. Fluorine compounds in forage will cause cattle to lose teeth and to have an overgrowth of leg bones and ribs. Odor from a rendering plant or from some chemical plants can depress the value of land for both commercial and residential use. New York City estimates that corrosion costs the city about \$6 million per year. Alternatives in sulfur dioxide control include the use of fuels with no sulfur, removal of the sulfur from the fuel, and removal from the gaseous products of combustion.

APTIC-22973

ATMOSPHERIC POLLUTION FROM PETROL AND DIESEL ENGINE VEHICLES.

Petrol. Rev., 24 (283):192-202, July 1970. 52 refs.

D. R. Fussell.

Identifiers: *Automotive emissions, *Internal combustion engines, Legislation, Toxicity, Great Britain, Engine exhausts, Crankcase emissions, Fuel tank evaporation, Carburetor evaporation losses, Smog, Smokes, Gasolines, Diesel engines, Automobiles, Buses, Automotive emission control, Fuel additives, Hydrocarbons, Tetraethyl lead, Carbon monoxide, Nitrogen oxides, Nitric oxide (no), Sulfur oxides.

Major pollutants from the gasoline engine are unburned hydrocarbons, nitric oxide, carbon monoxide, lead, some sulfur oxides, and particulates. Up to 4% hemoglobin deactivation can occur after exposure to street concentrations of 15-25 ppm CO, while there is some evidence that 5-10% deactivation may disturb psychomotor abilities, visible and audible perception, and multiple limb co-ordination. Photochemical reactions in which unburned

hydrocarbons are involved occur mostly in Los Angeles; the prime concern is their possible carcinogenic nature. The main interest in nitrogen oxide emissions is associated with its smog forming potential, while the concern with lead has to do with its being a cumulative poison. Vehicle emission legislation is mentioned for the United States and Europe. Emissions occur from the crankcase, the fuel tank, the carburetor, and the exhaust. The influence of mechanical and operating conditions, as well as fuel factors on emissions is discussed. Pollutant control techniques are also reviewed. As with gasoline engines, numerous mechanical and operating factors effect the emissions from diesel engines. When compared with the 'untreated' gasoline engine, diesels emit very much less CO, significantly less HC, but similar quantities of NO. White, black, and blue diesel smoke are discussed. The most effective of the antismoke additives have been colloidal dispersions of organic barium compounds. APTIC-22976

STUDIES ON ASSAM COALS, PART I: CHEMICAL CONSTITUTION RELATING TO SULPHUR COMPOUNDS.

J. Technol., 12 (1):43-48, June 1967. 3 refs. G. C. Basak.

Identifiers: *India, *Carbonization, *Coal characteristics, Asia, Ashes, By-product recovery, Coal preparation, Sulfur compounds, Chemical reactions.

Because of their unusually high sulfur content, Assam coals are unsuitable for use as industrial fuel. As part of an investigation of the possibilities of recovering sulfur from the coals, studies were conducted of the chemical composition of the coals and of the effects of carbonization on their sulfur content. The results of both low- and high-temperature carbonization showed that sulfur reduction was at a minimum where the percentage of ash increased during carbonization. This fact, coupled with their low pyritic sulfur content, suggests that Assam coals contain little or no inorganic sulfur. APTIC-22981

ODOR REMOVAL AT FISH AND ANIMAL MEAL PROCESSING PLANTS IN NORTHERN EUROPE. PART II.

(Hokuo ni okeru gyochokotsu, jukotsu shori kojo no dasshu taisaku. sono ichi). Text in Japanese. Akusho no Kenkyu (Odor Research J. Japan), 1 (2):28-34, June 20, 1970. Tatsukichi Ishiguro.

Identifiers: *Europe, *Fertilizer manufacturing, *Odor counteraction, Japan, Odors, Scrubbers.

Dank Andels Fish AMBA is a fish meal factory on an island of Denmark and owns nearly 200 ships which amounts to one-half of all the ships on this island. The materials processed are mainly codfish and herring. The company processes between 4000 t and 5000 t/year. Plant equipped by Atlas, with indirect thermal dryers, are operated by five employees. As it is this factory that successfully commenced odor removal sooner than in any other country in Europe, there is little or no fish smell in this plant. As one of the biggest companies in Europe, Andels Sildeli Fabriken AMBA in Esbjerg of Denmark, runs nine plants with the capacity of 300 t/day and 150 employees process about 230,000 t in raw materials, about 40,000 t in fish meal, 13,000 t in soluble materials, and 12,000 t in fish oil annually. Odor removal appeared rather poorly carried out at this plant. There is much to be improved on, especially washing as a whole. Blackford Mose Fabriken in Hantholm, Denmark was under construction at the time of author's visit and is supposed to be currently operating. As briefly commented, although many were considered instructive with respect to fish meal processing there were few with odor removal so far. Reports of management aspects are presented. APTIC-22987

ODOR REMOVAL AT FISH AND ANIMAL MEAL PROCESSING PLANTS IN NORTHERN EUROPE. PART I.

(Hokuo ni okeru gyochokotsu, jukotsu shori kojo no dasshu taisaku. sono ichi). Text in Japanese. Akusho no Kenkyu (Odor Research J. Japan), 1 (1):38-45, April 20, 1970. Tatsukichi Ishiguro.

Identifiers: *Europe, *Fertilizer manufacturing, *Odor counteraction, Japan, Odors.

Various remarks on the fish meal processing factories in Northern Europe are presented. They are concerned with the present situation of fish and animal meal processing industries, general concerns of some plants for odor removal, facilities for odor removal, general conditions and outlooks of those buildings, maintenance of equipments, and specifically technical aspects of odor removal in practice. Two plants are introduced. Doggerbank Fishmølsfabrikken in Denmark specialize in herring with fat content of between 15 and 20% and processes 22,000 t/year (220 days worked in 1967) or 100 t/day. The workers numbered only three, operating the Alfa Laval equipment. The water consumed for both odor removal and washing totals between 45 cu m and 50 cu m/hour. Fish odor can hardly be recognized, even inside the building. Fidehøder Ekstraktions and Fishmølsfabrikken in West Germany processes between 400 and 500 t/day and the main material is fish rubbish, occasionally round herring and codfish. The building is equipped with two roller driers by Atlas with the capacity of 300 t/day and two cookers with the capacity of 250 t/day and of 150 t/day, respectively. The employees number 45. Odor removal is poor at this plant. APTIC-23000

COMPUTATIONAL METHOD OF DETERMINING FLUORINE BALANCE DURING ALUMINUM ELECTROLYSIS.

(Raschetnyy metod opredeleniya balansa flora pri elektrolize alyuminiya). Text in Russian. Tsvetn. Metal., 40 (2):59-62, 1967. 8 refs. S. S. Solntsev.

Identifiers: *Fluorides, *Electrolysis, *Aluminum, *Primary metallurgical processing, USSR, Stack gases, Mathematical analyses, Fluorinated hydrocarbons, Cooling.

The following quasiempirical formulas for fluorine loss during electrolytic production of aluminum are presented: 1) loss with exhaust gases as a function of cryolite content of the electrolyte and electrolyte temperature; 2) loss with fettlings as a function of service interval; 3) loss in the form of CF₄ as a function of the number of anode effects, duration of anode effect, and % yield in terms of current; 4) mechanical loss as a function of the fluoride content of the raw material; and 5) loss with the coal ash. Fluorine loss through exhaust gases is reported for three installations and ranges from 18.97 to 25.63 kg/t. It is estimated that cooling the process by 5 degrees C will reduce fluorine consumption by 0.2 kg/t, while increasing the cryolite ratio by 0.1 will affect approximately a 3 kg/t savings. APTIC-23022

MONTREAL INCINERATOR TO BE CLEAN STEAMER.

For primary bibliographic entry see Field 02. APTIC-23025

INDUSTRIAL MANGANESE POISONING.

For primary bibliographic entry see Field 07. APTIC-23028

PRODUCTION OF BACTERIAL AEROSOLS IN AN ANIMAL RENDERING PLANT PROCESS.

Dugway Proving Ground, Utah, DPGRR-101, 21p., July 25, 1936. CFSTI: AD 101247 J. Clifton Spendlove.

Identifiers: *Bacteria, *Rendering, Microorganisms, Aerosols, Samplers, Dispersion.

After an ornithosis outbreak with some fatalities from infected turkeys near Portland, Oregon, the possibility that infective aerosols were produced by commercial processing of diseased animal tissue was investigated. Vegetative and spore-forming organisms were pointed out on carcasses which were then processed. Anderson samplers showed that these organisms were present in aerosols both in the plant and 100 ft downwind. It is recommended that all animal material be heated prior to processing, and that plant machinery be redesigned to minimize aerosol production. It is pointed out that, since many of the animals handled in such a plant have died from diseases that are transmissible to man, such plants may represent a hazard to a great many communities. (Author abstract modified) APTIC-23030

INJURY TO VEGETATION BY SMELTER FUMES.

U. S. Dept. Agr. Bur. Chem., Bull. 89, 23p. 1905. 4 refs.

J. K. Haywood.

Identifiers: *Trees, *Plant damage, *Sulfur dioxide, Copper, Fumes, Primary metallurgical processing, Arsenic compounds, Sulfur trioxide.

Investigations were conducted to determine whether fumes from a copper smelter were injurious to vegetation and, if so, how large an area was affected. About 60 samples of trees, water, soil, and ore were taken from distances one to three miles from the smelter and subjected to chemical analysis, from which very definite results were obtained. Of 26 groups of trees examined, the percentage of sulfur trioxide in leaves was higher in injured trees than in uninjured. In most cases, the increased sulfur trioxide concentrations were attributable to sulfur dioxide fumes. The sulfur trioxide concentrations varied with distance from the smelter, and high concentrations were correlated with prevailing wind direction. The sulfur content of the ore in the area was found to average 41.48%. It is assumed that 90% of the sulfur is liberated by the extraction of copper as a day. Water in a creek running by the smelter was not only very acid but contained traces of arsenic and dissolved copper. Injury to vegetation in the area is expected to continue unless the smelter fumes are condensed. APTIC-23036

POLLUTION BY OXIDES OF SULPHUR.

For primary bibliographic entry see Field 02. APTIC-23044

BRIGHT FUTURE FOR ARC CYCLE PLANTS

For primary bibliographic entry see Field 02. APTIC-23047

LEAD POISONING. AN OLD PROBLEM WITH A NEW DIMENSION.

For primary bibliographic entry see Field 07. APTIC-23058

ADDITIONAL STUDIES OF POLYCYCLIC HYDROCARBONS IN CIGARETTE SMOKE. (COMPARISON OF ASPIRATED SMOKE AND THAT COLLECTED FROM ROOM AIR).

For primary bibliographic entry see Field 03. APTIC-23064

EFFECT OF ENGINE INTAKE-AIR MOISTURE ON EXHAUST EMISSIONS.

Preprint, Society of Automotive Engineers, Inc., New York, 31p., 1970. 8 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 12-16, 1970, Paper 700107.) W. J. Brown, S. A. Gendernalik, R. V. Kerley, and F. J. Marsee.

Identifiers: *Engine exhausts, *Humidity, *Nitric oxide (no), Internal combustion engines, Automobiles, Hydrocarbons, Carbon monoxide.

As atmospheric humidity increases, the emission of nitric oxide from automobiles decreases. This effect is so large that a factor for correcting observed NO to some standard humidity is desirable. Emission tests are conducted at 76 F and at four humidities on a fleet of eight passenger cars in accordance with the Federal test cycle. A derived equation relates the concentration of NO (measured by continuous trace analysis in accordance with the proposed 1971 California procedure) to differences in air moisture at the time of the test. Factors are also included to correct NO concentrations measured during other types of operation and to correct hydrocarbon and carbon monoxide emissions measured during a Federal Cycle. (Author abstract modified)

APTIC-23087

A PRELIMINARY SURVEY OF HYDROCARBON-DERIVED OXYGENATED MATERIAL IN AUTOMOBILE EXHAUST GASES

J. Air Pollution Control Assoc., 10 (5):367-371, Oct. 1960. 9 refs. (Presented at the Air Pollution Control Association Annual Meeting, 53rd, Cincinnati, Ohio, May 22-26, 1960.)
K. J. Hughes, and R. W. Hurn.
Identifiers: "Engine exhausts, "Operating variables, "Oxygenated fractions, Engine operating cycles, Internal combustion engines, Gas chromatography, Dynamometers, Alcohols, Acetaldehyde, Propionaldehydes, Ethylene, Ketones.

Experiments are reported to outline the types and quantities of oxygenates in auto exhaust gases, using modified gas chromatographic techniques for analysis. Compounds determined in the gas liquid partition chromatographic analytical system included ethylene and propylene oxides, methanol, ethanol, isopropanol, propanol, acetone, methyl ethyl ketone, acetaldehyde, and propionaldehyde. A V-8 engine connected to an absorption dynamometer and to an auxiliary engine was operated in the following modes: simulated cruise, misfired, deceleration, and motored. Exhaust emissions are influenced qualitatively and quantitatively by both mode of engine operation and fuel composition. More than 30 oxygenates in the molecular weight range of ethylene oxide through pentanol were found, with 14 of these positively identified to date. Low concentrations of oxygenates are present in exhaust produced during automotive engine cruise and acceleration operations when ignition is consistently good. However, ignition malfunctions will significantly raise emissions of oxygenates, and during periods of deceleration or motored operation, the amount of oxygenates may approach the quantity of hydrocarbons in the exhaust gases. (Author conclusions modified)

APTIC-23089

NITROGEN OXIDE KINETICS DURING RAPID EXPANSION OF OCTANE-AIR COMBUSTION PRODUCTS

Preprint, Stevens Inst. of Technology, Hoboken, N. J., Combustion Lab., 15p., 1970. 13 refs.
James L. Hodges, and Robert F. McAlvery.
Identifiers: "Spark ignition engines, "Nitric oxide (no), Automotive emissions, Combustion gases, Monitoring, Ultraviolet spectrometry, Test engines, Decomposition, Combustion, Reaction kinetics, Pressure.

A prerequisite to a rational approach to the reduction of nitric oxide emissions from spark ignition engines is an understanding of the kinetic processes which lead to formation of nitric oxide as a result of combustion and its subsequent partial decomposition during the power stroke. An analog device which simulates combustion of hydrocarbon fuel-air mixtures and expansion of the combustion products in engines was constructed. Pressure traces obtained with the device are considerably more reproducible than traces obtained using actual engines. An ultraviolet absorption monitoring technique can be used to determine exhaust gas nitric oxide concentration. Although reported data scatter was moderately

high, it is thought that this scatter is more a consequence of actual run to run variations in nitric oxide concentration than any inherent imprecision in the monitoring technique. At operating temperatures and pressures typical of spark ignition engines, time-resolved data can probably not be obtained with this method. However, it may be possible to obtain time resolved data by reducing initial cell pressure. Unless nitric oxide concentration always freezes during cooling, even at the low cooling rates associated with constant volume combustion, it appears that changes which occur during the expansion of combustion product gases do not significantly effect measured exhaust gas nitric oxide concentration. (Author summary modified)

APTIC-23097

COLIFORM AEROBES ISOLATED BY SEWAGE TREATMENT PLANTS

For primary bibliographic entry see Field 03.
APTIC-23156

WILL THE SST POLLUTE THE STRATOSPHERE

Science, 168 (3939):1562, June 26, 1970. 3 refs.
Virginia D. Nurnale, and Robert W. Holcomb.
Identifiers: "Engine exhausts, "Jet aircraft, "Middle atmosphere, "Micrometeorology, Fuel, Aircraft, Clouds, Temperature (atmospheric), Carbon dioxide, Carbon monoxide, Nitrogen oxides, Nitric oxide (no), Ozone, Solar radiation, Ultraviolet radiation, Water, Vapors.

During each hour of flight at cruising altitude (in the lower part of the stratosphere at 16 to 22 kilometers), the supersonic transports will burn an estimated 66 tons of fuel; from this they will produce about 83 tons of water, 72 tons of carbon dioxide, and approximately 4 tons each of carbon monoxide and nitric oxide. Water is more likely to be a problem than the gaseous exhaust products because stratospheric water concentrations are generally low as the result of condensation in the troposphere. If water added directly to the stratosphere accumulates, it could directly change the radiation balance of the earth, initiate cloud formation and thus increase the amount of solar energy reflected into space, or lead to a decrease in the ozone concentration of the stratosphere thereby allowing more ultraviolet radiation to reach the earth's surface. Dynamic models of the stratosphere have been developed in order to determine the behavior of water once it is injected. Although based on imprecise knowledge, a water vapor increase from 3 to 5 ppm is suggested to cause a decrease of 1.5 C in the stratospheric temperature and an increase of 0.6 C in the temperature at sea level. From a computer model of ozone behavior, it is indicated that the photochemical reaction is most efficient at altitudes above the proposed SST flight. Research flights have suggested that the few clouds formed in proposed SST flight paths would produce no serious climatic changes, but there are extremely cold areas at an altitude of about 17 kilometers in the tropical tropopause and high above the Arctic and Antarctic that are thought to be saturated.

APTIC-23166

A SUMMARY OF RECENT PROGRESS IN AEROSOL RESEARCH AT BROOKHAVEN NATIONAL LABORATORY

Preprint, Brookhaven National Lab., Upton, N. Y., 15p., 1969. 5 refs. (Presented at the Specialist Meeting on the Behavior of Nuclear Aerosols in closed Systems, Kernforschungszentrum Karlsruhe, Germany, Nov. 11-12, 1969.) CFSTI: BNL 14271
A. W. Castleman Jr.
Identifiers: "Radioactive radiation, "Aerosols, "Reactors (nuclear), Particle size, Computer programs, Data analysis, Mathematical modeling, Transport, Plutonium compounds, Sodium compounds, Uranium compounds, Chemical reactions, Reaction mechanisms.

Progress being made on a program aimed at developing a fundamental understanding of the chemical reactions, mechanisms of release, and transport behavior of the fission products and radioactive aerosols emanating from nuclear materials under conditions likely to be encountered in the event of a fast-breeder reactor accident is described. Experimental work is designed to provide information on the nature of aerosols composed of plutonium, uranium, and sodium compounds. A theoretical program designed to provide a basic understanding of aerosol behavior in closed systems is described. Computer codes being developed for use in predicting the time dependence of the mass concentration, number concentration and particle size distribution are described. The codes are used in data correlation and evaluation as well as for making scale-up calculations to realistic power-reactor accident conditions.

APTIC-23170

INVESTIGATION OF THE CASCADE METHOD OF COMPRESSING METHANE

For primary bibliographic entry see Field 02.
APTIC-23179

CONSTRUCTION OF BELOW GROUND RESERVOIRS FOR THE STORAGE OF LIQUEFIED NATURAL GAS

For primary bibliographic entry see Field 02.
APTIC-23184

SURVEY OF LITERATURE RELATING TO ATMOSPHERIC POLLENS AND HAY FEVER

Preprint, Public Health Service, Cincinnati, Ohio, Environmental Health Center, 40p., Jan. 1950. 162 refs.
John S. Wiley.
Identifiers: "Hayfever, "Pollens, "Pollen collectors, Allergies, Bacteria, Ragweed, Air quality measurements, Particulate classifiers, Particulate sampling, Impingers, Electrostatic precipitators, Sedimentation.

A review of literature relating to atmospheric pollens and hay fever is presented. A number of the references pertain largely to bacterial air sampling. The historical background of pollen counting is presented. Some methods of pollen determination are sedimentation, impingement, and electrostatic dust sampling. The literature review includes sections on identification of pollens, concentration calculations, serial distribution of ragweed pollen, allergens, and ragweed control.

APTIC-23191

TRANSCO'S LNG OPERATIONS

For primary bibliographic entry see Field 02.
APTIC-23194

METHANE FUEL SYSTEMS FOR HIGH MACH NUMBER AIRCRAFT

For primary bibliographic entry see Field 02.
APTIC-23204

STUDY OF THE PROCESS OF FORMATION OF CARBON BLACK PARTICLES DURING DECOMPOSITION OF HYDROCARBONS

Gaz. Prom., 12 (8):40-46, 1967. 14 refs. Translated from Russian. Foreign Technology Div. Wright-Patterson AFB, Ohio, Translation Div. 14p., Jan. 8, 1970. CFSTI, DDC: AD 702847
V. F. Surovkin, and L. S. Kazakov.
Identifiers: "Hydrocarbons, "Decomposition, "Carbon black, Ussr, Fuels, Mathematical analyses, Combustion, Gases, Temperature.

The process of formation of carbon black particles during decomposition of hydrocarbons in an industrial reactor can be described by the Semenov equation for branched chain processes with quadratic breaks in the chain. The specific surface of the carbon black can be determined by theoretical

cal calculations according to the technological parameters of its manufacture. The heating up and evaporation of hydrocarbon raw material, and also the formation and growth of carbon black particles, occupy (2-3) times 10 (minus superscript 3)s in an industrial reactor with gases moving at a speed on the order of 300-400 m/s in the zone in which they are mixed with hydrocarbons. Atomization of the hydrocarbon raw material by high-temperature gases from the complete combustion of the fuel at a high relative rate of motion ensures that the raw material will be heated at a high rate. In this process, the magnitude of the specific surface of the carbon black depends on temperature and hydrocarbon concentration in the reaction gas. The temperature of the gases in the reaction chamber of an industrial reactor is not consistent along its length. Due to exothermic reactions, the temperature rises rapidly in the initial zone. It achieves the maximum at the moment of total consumption of oxygen, then is reduced by exothermic reactions.

APTIC-23210

THE ALGERIA-UNITED KINGDOM LIQUEFIED NATURAL GAS PRODUCT (LNG SYMPOSIUM).

For primary bibliographic entry see Field 02.

APTIC-23223

NATURAL GAS LIQUEFACTION PILOT FACILITY OPERATED FOR 2800 HOURS.

For primary bibliographic entry see Field 02.

APTIC-23224

PROGRESS IN LPG AND LIQUID NATURAL GAS VAPORIZATION.

For primary bibliographic entry see Field 02.

APTIC-23225

STATUS OF LNG STORAGE.

For primary bibliographic entry see Field 02.

APTIC-23226

LEAD AND URANIUM IN PENNSYLVANIA ANTHRACITE.

Chem. Geol., vol. 6: 43-49, 1970. 8 refs.

T. J. Chow, and J. L. Earl.

Identifiers: *Pennsylvania, *Coal characteristics, *Lead compounds, *Uranium compounds, Mass spectrometry, Isotopes.

Lead concentration, its isotopic composition, and the uranium content of Pennsylvania anthracites was determined. Mass spectrometric analyses were performed on samples which had been pulverized, weighed, and ashed at 425 C to constant weight. Square root of mass ratio corrections are incorporated in the data to compensate for velocity discrimination in the electron multiplier. Lead and uranium concentrations were determined by the isotope dilution method which is accurate to 0.01 micrograms. The ash content of the four washed Pennsylvania anthracites ranged from 9.5-12.8%, contrasted with the one Rhode Island unwashed meta-anthracite with 58% ash. The uranium concentration of three Pennsylvania anthracite samples was 1.35, 2.10 and 2.65 ppm, respectively. For the Eastern Middle, Western Middle, and Southern Field anthracites, the average lead concentration was 11.4 ppm, with the Northern Field sample having a lead concentration of 33.8 ppm, three times higher than the others. This disparity is also reflected in the isotopic composition, with the Northern Field anthracite lead being less radiogenic than the other three leads. From the isotopic analysis, it is interpreted that common lead was incorporated into the ancient, bedded plant material in Carboniferous times prior to coalification, while the uranium was introduced into the anthracite after coalification.

APTIC-23229

AUTOMOBILE EMISSIONS-A STUDY IN ENVIRONMENTAL BENEFITS VERSUS TECHNOLOGICAL COSTS.

Preprint, Inst. of Mechanical Engineers, London (England), Automobile Div., 19., 1969. 37 refs.

(Presented at the Institution of Mechanical Engineers, Automobile Division Council, Coventry, England, Nov. 4, 1969, Paper 700182.) P. S. Myers.

Identifiers: *Automotive emissions, Particulates, Internal combustion engines, Automobiles, Catalytic afterburners, Air-fuel ratio, Spark timing, Engine design modification, Hydrocarbons, Tetraethyl lead, Carbon dioxide, Carbon monoxide, Nitrogen oxides, Sulfur dioxide.

Recent increase in man-caused additions to the atmosphere are markedly changing its quality. With rising population, these additions will increase in the future. The magnitude of the overall problem in relation to mass rate balances for particulate matter, carbon dioxide, and monoxide, nitrogen oxides, sulfur dioxide, lead, and hydrocarbons is discussed. Pollution from automobiles is discussed specifically, along with some possible solutions (both with the existing reciprocating engine and alternate power sources), the effect of controls, and the long-term reduction of emissions. Exhaust recycling, mixture variations, and catalytic exhaust systems are possible controls. Methods of cooperation between government, manufacturers, and the public are suggested. (Author abstract modified)

APTIC-23250

FUEL: A FACTOR IN INTERNAL COMBUSTION ENGINE EMISSIONS.

Preprint, American Society of Mechanical Engineers, New York, Sp., 1969. 5 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, Los Angeles, Calif., Nov. 16-20, 1969, Paper 69-WA/APC-8.) R. W. Hurn.

Identifiers: *Engine exhausts, *Fuel evaporation, *Internal combustion engines, Fuel tank evaporation, Carburetor evaporation losses, Fuels, Automobiles, Hydrocarbons, Combustion, Volatility.

Characteristics of fuel used in an internal combustion engine influence both the amount and the nature of air pollutants associated with engine use. Automotive emissions originate from the fuel system and the exhaust system. Volatility of the fuel affects the amount of emissions evaporating from the fuel system, while the hydrocarbon composition and distribution of the fuel govern the reactivity of these emissions. Exhaust emissions are affected only indirectly by fuel composition; engine parameters greatly influence the extent to which fuel influences the exhaust emissions. While the flame-quenching phenomenon accounts for a portion of the unburned hydrocarbons, other hydrocarbons appear in the exhaust as products of combustion. These are the light C₁, C₂, and C₃ hydrocarbon fuel fragments and C₄-and-heavier hydrocarbons that have been chemically restructured under the thermal stress of combustion. Fuel-tank losses occur both as a result of fuel vaporization that provides a driving force to displace vapors from the tank, and as a result of temperature cycles that induce the tank to breathe alternately inward and outward. Carburetor losses are a result of fuel boiling from the carburetor in much the same fashion as water that is boiled from an open pan. Several studies to relate fuel variables and emission characteristics are reported. While there is as yet no satisfactory single measure of the potential that emissions hold for becoming objectionable, observations of artificially induced photochemical reactions provide one useful approach. The fuel factor becomes highly important in any consideration of reducing the amount of lead that is used in motor fuel for octane quality control. (Author conclusions modified)

APTIC-23252

THE SEARCH FOR LOW EMISSION VEHICLE PROPULSION.

For primary bibliographic entry see Field 02.

APTIC-23253

THE GENERATION OF GAS AND OF DUST IN THE MANUFACTURE OF MOLDS AND CORES BY THE SHELL MOLDING PROCESS.

(Die Gas- und Staubeentwicklung beim Herstellen von Formen und Kernen nach dem Maskenformverfahren). Text in German. Giesserei (Duesseldorf), 36 (5):113-121, Feb. 1969. 13 refs.

Heinrich Siepmann, Manfred Puetz, and Wolfgang Swagat.

Identifiers: *Dusts, *Metal fabricating and finishing, *Gases, Germany, Air quality measurements, Hydrocyanic acid, Phenols, Ammonia, Carbon monoxide.

In the shell molding process used in foundries, synthetic resin is decomposed at 220 C; this generated phenol, hydrogen cyanide, carbon monoxide, and ammonia. The concentrations of these gases were determined by means of a gas detector apparatus at various work sites (differing by the weight of the mold manufactured from 1 to 7 kg) at the operator's breathing level. The concentration, particle size, and the mineralogical as well as the chemical composition of the silicogenic dust generated by the shell molding process were simultaneously determined; the results were correlated with the sand throughput per working shift (from 100 to 1950 kg). Initial HCN concentrations of 130 to 45 ppm dropped after 6 seconds to a residual concentration of 7-3 ppm; initial CO concentrations of 1855 to 1050 ppm dropped after 6 seconds to a residual concentration of 25 to 4 ppm; initial ammonia levels of 290 to 110 ppm dropped after 120 seconds to 4 to 1 ppm; and phenol, from 25 to 10 ppm to 2.5 to 0.5 ppm after 36 seconds. The dust particle count over an 8 hour shift fluctuated between a minimum of 50 and a maximum of 925 particles per cu cm and was unrelated to the quantity of sand processed. A statistical evaluation of these results disclosed that the operation required an exhaust velocity at the operator's breathing level exceeding 0.6 m/s if the toxic levels of the generated gases and dust were to be brought within permissible limits. For purposes of toxicity calculations, the concentrations of the simultaneously generated gases were added to each other.

APTIC-23276

A CHEMICAL STUDY OF HAWAIIAN VOLCANIC GASES.

Hawaii Univ., Honolulu, Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., Sept. 1967, 181p. 98 refs.

James Bruce Finlayson.

Identifiers: *Volcanoes, *Chemical composition, *Combustion gases, Hawaii, Gas chromatography, Gas sampling, Carbon dioxide, Sulfur compounds.

A chemical study of volcanic gases from a variety of sources at Kilauea Volcano on the island of Hawaii is reported. During a flank eruption, gas samples were taken from the molten surface of a lava lake as it was forming. The gas sampling technique is described. A gas chromatographic method of analysis was developed and is discussed. The analysis of samples from all collecting sites shows varying degrees of air contamination. Relatively large compositional variations are found in samples from the same source. This is in part a reflection of the air contamination, but it is also due to the relatively poor precision of gas analysis. A gradual depletion of the principal carbon and sulfur gases with time is seen. Certain samples are examined for compositional changes that might allow prediction of eruptions; indications are that total sulfur gas content may be the key. The interpretation of the role played by the gas phase in volcanics would be greatly aided by more frequent and systematic sampling of volcanic gases. (Author abstract modified)

APTIC-23284

Field 1—EMISSION SOURCES

INJURY TO VEGETATION AND ANIMAL LIFE BY SMELTER WASTES.
For primary bibliographic entry see Field 08.
APTIC-23287

SULPHUR DIOXIDE AS A SOURCE OF VOLCANIC SULPHUR.
Proc. Indiana Acad. Sci., 1918:170-171. 8 refs.
Jacob Papish.
Identifiers: *Volcanoes, *Sulfur dioxide, *Sulfur compounds, Carbon monoxide, Reduction, Cooling.

A hypothesis to explain the formation of certain volcanic sulfur deposits from sulfur dioxide is presented, suggested by laboratory observations and based on the example of sulfur recovered from Lake Ponto, a crater lake in the southwestern part of Kusaishi Island, Japan. The reduction of SO₂ in the lake water exhaled by the volcano to elementary sulfur can be assumed to take place through its interaction with carbon monoxide, which is very commonly found in volcanic exhalations together with other reducing gases. The freshly formed sulfur cools suddenly on coming in contact with the water in the lake and condenses in the form of oolitic grains.
APTIC-23301

LIQUEFIED GAS TANKERS.
For primary bibliographic entry see Field 02.
APTIC-23302

SMOKE AND GASES PRODUCED BY BURNING AIRCRAFT INTERIOR MATERIALS.
Nat. Bur. Stand. (U. S.) Bldg. Sci. Ser. 18, 27p., Feb. 1969. 12 refs.
D. Gross, J. J. Loftus, T. G. Lee, and V. E. Gray.
Identifiers: *Materials, *Smokes, *Aircraft, Smoke shade, Colorimetry, Spectrophotometry, Hydrochloric acid, Hydrocyanic acid, Carbon monoxide, Combustion, Gases.

Measurements are reported of the smoke produced during both flaming and smoldering exposures on 14 aircraft interior materials. Smoke is reported in terms of specific optical density, a dimensionless attenuation coefficient which defines the photometric obscuration produced by a quantity of smoke accumulated from a specimen of given thickness and unit surface area within a chamber of unit volume. A very wide range in the maximum specific optical density was observed. For the majority of materials, more smoke was produced during the flaming exposure test. However, certain materials produced significantly more smoke in the absence of open flaming. During the smoke chamber tests, indications of the maximum concentration of CO, HCL, HCN, and other selected potentially toxic combustion products were obtained by means of colorimetric detector tubes. A study was made of the operation, accuracy, and limitations of the tubes. Concentrations of HCL were also measured with specific ion electrodes. Qualitative identification of the major components of the original test materials was accomplished primarily by infrared absorption spectrophotometry. (Author abstract modified)
APTIC-23312

AIR POLLUTION IN CAROLINE COUNTY MARYLAND.
For primary bibliographic entry see Field 12.
APTIC-23313

AIR POLLUTION IN TALBOT COUNTY MARYLAND.
For primary bibliographic entry see Field 12.
APTIC-23314

MOTOR CARS AS THE MAIN SOURCE OF AIR POLLUTION.
Text in Hebrew. Harefuah (J. Israel Med. Assoc.), 78 (6):289-294, March 15, 1970. 20 refs.

J. Kandler, and A. Donagi.
Identifiers: *Engine exhausts, *Internal combustion engines, Asia, Smokes, Engine operating cycles, Gasolines, Diesel engines, Spark ignition engines, Automobiles, Automotive emission control, Hydrocarbons, Lead compounds, Carbon monoxide, Nitric oxide (no), Nitrogen dioxide (no2).

Haagen-Smith of California discovered that the main source of air pollution is cars. Car engines are divided into two groups, gasoline fueled and diesel fueled. Gasoline engine exhaust contains carbon monoxide, lead, nitric oxide, nitrogen dioxide, and hydrocarbons. The concentration and mix depend upon the condition of the engine and its motion status: idling, accelerating, cruising, or decelerating. By comparison, the diesel engine emits less CO, NO, NO₂, and no lead at all. Two types of smoke are characteristic of diesel exhausts, hot smoke and cold smoke. The former is a result of burning too rich a fuel mixture in an attempt to get more power, which it does at the cost of eliminating the inherent economy of diesel operation. Certain faulty driving techniques provide a similar exhaust. Cold smoke, resulting from low-temperature combustion as when the engine is not up to its normal operating temperature, contains small particles of unburned fuel. Both diesel and gasoline engines are important contributors to air pollution and its concomitant danger to health, animal and vegetable life, and the weather. The principal differences between automotive and industrial pollution is that the former is emitted in more populated areas. In the United States and particularly in California, they are very advanced in the means of controlling or avoiding the problem of automotive pollution. Automobile manufacturers are compelled to install special devices on all new cars to reduce the emission of harmful gases. One of the main problems that has not been solved yet is the reduction of NO and NO₂ emissions.
APTIC-23316

ENVIRONMENTAL HEALTH PROBLEMS OF URBAN AREAS.
Environ. Health, 78 (3):102-118, March 1970. 35 refs.
E. W. Ward.

Identifiers: *Great Britain, *Urban areas, *Sources, Plans and programs, Planning and zoning, Socio-economic factors, Toxicity, Health impairment, Buildings, Automotive emissions, Smokes, Industrial emission sources, Solid waste disposal, Stacks, Vehicles, Sulfur dioxide.

Environmental pollution, industrial effluents, pollution of the sea, solid wastes, air pollution from road vehicles, industrial air pollution, domestic smoke control, noise pollution, food inspection, housing in urban areas, and environmental planning are reviewed for Great Britain. The natural resources of the world are consumed at an alarming rate, and the logical approach to solid waste disposal is one of conservation, to minimize generation of waste material, to salvage and reuse waste, and to dispose of the irreducible amount in a manner which will conserve the disposal site, or if incinerated, produce steam for district heating. Combustion of fossil fuels represents a danger to health, causes damage to materials, and impairs agricultural efficiency. Effects of low chimneys, pollution by sulfur dioxide, and town planning are discussed. Noise protection zones and the effects of heavy vehicles on minor roads are mentioned. Food poisoning, contamination, and food hygiene regulations are reviewed. Clearance programs, housing rehabilitation, and multiple occupation are included, as well as an appendix with financial data for dwelling improvements. The unplanned sprawl of towns and cities, the gross pollution of the environment, the extinction of many forms of life, the ignorance of man, and the inadequacy of education places an impossible strain upon our resources.
APTIC-23323

HYDROCARBONS AND ATMOSPHERIC POLLUTION.
For primary bibliographic entry see Field 03.
APTIC-23328

COMPOSITION AND DETERMINING OF BOOT EMISSIONS.
For primary bibliographic entry see Field 03.
APTIC-23330

STEAM ENGINES AGAIN YES—BUT WITH A NEW APPROACH.
For primary bibliographic entry see Field 02.
APTIC-23338

2. CONTROL METHODS

PROCESS FOR THE DESULPHURIZATION OF COMBUSTION GASES.
(Bergwerksverband G.m.b.H., Essen, W. Germany) Brit. Pat. 1,030,942. 3p., May 23, 1966. (Appl. Aug. 21, 1964, 10 claims).
Personal Author Not Recorded.
Identifiers: *Catalytic oxidation, *Adsorption (general), Charcoal, Metals, Platinum, Europe, Germany, Pollutants, Combustion products, Combustion gases, Control methods, Sulfur oxides control, So₂ removal (combustion products), Metal compounds, Vanadium compounds, Sulfur oxides, Sulfur dioxide, Sulfur trioxide, Catalysis.

A process is described for the desulfurization of combustion gases by catalytic oxidation. Sulfur dioxide is oxidized to SO₃ upon contact with a platinum or vanadium pentoxide catalyst in the form of a solid bar or a stationary or slightly moving bed. The oxidation may take place in a fluidized bed, a fixed bed, or a cloud of fine dust at 450 C. The sulfur trioxide is subsequently adsorbed by passage of the gas over activated carbon at 150 C.
APTIC-18156

APPARATUS FOR REVERSE AIR CLEANING OF DUST COLLECTORS.
(National Gypsum Co., Buffalo, N. Y.) U. S. Pat. 3,430,419, March 4, 1969. 8p. 11 refs. (Appl. May 3, 1967, 4 claims).
Paul W. Reinecke, Ronald L. Van Sipe, Walter W. Dowd, Donald O. Liske, and Daniel J. Betoski.
Identifiers: *Dusts, *Bag filters, Pollutants, Particulates, Settling particles, Control equipment, Control methods, Maintenance, Process modification, Design criteria.

An improvement to the bag type of dust collector which allows for the continuous cleaning of the entrapped dust is described. The type of collector considered has several separate compartments with separate inlet and outlet ducts. The invention describes a valving system at these ducts operating in a rotary fashion so that at all times a few of the filtering compartments would be cleaned by a reverse flow of air. The effect of the rotary valving system would be a continuously operating cleaning system. The reverse flow would be generated by a compressor designed to give a pulsation to the air stream which is very effective in loosening entrapped air.
APTIC-18157

WHAT DOES IT COST TO DESULFURIZE FUEL OIL.
Chem. Eng. Progr., 61 (9):49-58, Sept. 1965. 14 refs.

L. S. Galstoun, B. J. Steigerwald, J. H. Ludwig, and H. R. Garrison.
Identifiers: *Process modification, *Mathematical modeling, *Simulation, *Costs, *Fuel oil preparation processes, Pollutants, Combustion products, Sources, Fuels, Fuel oils, Industrial emission sources, Chemical processes, Petroleum refining, Control methods, Sulfur oxides control, Desulfurization of fuels, Hydrodesulfurization, Mathe-

matial analyses, Hydrogen, Sulfur oxides, Sulfur dioxide, Administrative and social, Standards, Fuel standards.

The economics of restricting the sulfur content of residual fuel oil were investigated by the application of linear programming and mathematical modeling to samples of California crude oil; and mixtures of Kuwait crude and fuel oil. Computer simulation, using linear programming or similar techniques, is necessary to achieve an optimum balance among a refinery's processing units. The refinery model was structured to use the hydrogen by-product of catalytic refining units for various hydrogen-consuming units. Additional needs were met by a steam-hydrocarbon reforming unit which used by-product gases such as fuel and feedstock. When fuel oil sulfur restrictions were severe, the model diverted to the fuel pool a large part of the marginal butylenes and propylenes normally converted to gasoline. The cost of meeting any sulfur restriction was obtained by comparison with a base case having no residual fuel oil sulfur unit; cost curves were plotted to represent the differential costs divided by the total barrels of fuel oil produced. The study showed that manufacture of low-sulfur residual fuel oil requires an incentive pricing of \$0.42 to \$0.65/bbl above fuel oil produced without sulfur restriction. Since the current market price is not sufficient, imposition of a residual oil hydrodesulfurization unit will further reduce the production of fuel oil from domestic refineries.

APTIC-18191

THE PRESENT STATE OF FLUE GAS DESULFURIZATION.

(Stand der Abgasentschwefelung). Text in German. Mitt. Ver. Grosskesselbesitzer, 49 (1):9-15, Feb. 1969. 11 refs. (Presented to the VGB, Emissions Meet., Salzburg, Bielefeld, and Saarbrücken, 1968).

K. M. Zentgraf.

Identifiers: *S₂ removal (combustion products), Germany, Combustion gases, Steam plants, Costs.

The activated coal process developed by the firm Hitachi, the Kiyoura-TIT process, using vanadium pentoxide for oxidizing sulfur dioxide to sulfur trioxide and the Mitsubishi process, which converts the sulfur oxides to manganese sulfate, have only been tested with flue gases of oil-fired boilers. Additional equipment is required to use these processes for desulfurization of the dust-laden flue gases of coal-fired steam plants. In the U. S. a pilot plant using the alkalized-alumina-process is presently in operation. It treats 1300 cu m flue gas/hr, with an easily attainable 90% desulfurization. The main problem here is the development of a non-abrasive catalyst. The combustion-Engineering process - injecting pulverized calcium products into the boiler - is presently being tested in two coal-fired pilot plants with 1600 and 5000 cu m flue gas circulation per hr. Pilot operations using additive suspensions for injection into the boiler which are under way in Germany include the Reinluft process (low-temperature soft coal coke is used as adsorbent), and the Still process. Almost all desulfurization processes are still in the experimental stage. Investment costs run between \$11 and \$21/kW. In order to keep the operating costs reasonable the sulfur content of the fuel and utilization must be high. The Combustion Engineering and Bischoff processes, which are largely the same, have investment costs running at about \$4/kW, but their useful lifetime is short, however.

APTIC-19048

A REVIEW OF AIR POLLUTION PROBLEMS AND CONTROL IN THE CERAMIC INDUSTRIES.

Preprint, American Ceramic Society, Columbus, Ohio, 25p., May 5, 1970. 19 refs. (Presented at the American Ceramic Society Annual Meeting, 72nd, Philadelphia, Pa., May 5, 1970.)

Arch B. Tripler Jr., and G. Ray Smithson Jr.

Identifiers: *Ceramics, *Control equipment, Humans, Occupational health, Lung cancer, Asbestos, Silicosis, Bricks, Cements, Glass, Mineral products, Asbestos, Stack gases, Dusts, Fly ash, Fumes, Smokes, Fuel gases, Fuel oils, Furnaces, Kilns, Mineral processing, Stacks, Centrifugal separators, Filters, Scrubbers, Adsorption, By-product recovery, Process modification, Fluorine compounds, Sulfur dioxide, Silicon compounds, Costs, Maximum allowable concentration.

Air pollution in the ceramic industry stems from the large amounts of dust and fumes which form at various processing stages. Five segments of the industry (glass, cement, mineral wool, asbestos, and brick) are considered. Prior to the analysis of the problems of each of these, eight basic control methods are listed along with comment on the application and approximate cost of each. The control methods listed are cyclones, scrubbers, fabric filters, electrostatic precipitators, adsorption, burning, stacks, and process modification. In the manufacture of glass three chief sources of air contaminants are batch drying of finely divided raw material prior to melting, gas or oil fired melting furnaces, and glass forming. The first of these presents only a dust problem. The furnaces, on the other hand, emit particulates and a gas combination representing both fuel products and the melt composition. Glass forming machines generate heavy smoke from vaporization of hydrocarbon lubricants. Both process modification and electrostatic precipitation are recommended. In the cement industry, dust is the major problem; dust reclamation is an economic necessity. In spite of highly efficient collection, some of the dust escapes. Dustfall rates of 35 tons per square mile were recorded in areas adjacent to efficiently controlled kilns. A secondary problem is the effluent from the kilns which contain gaseous pollutants from the fuel and from the heating of the components. In the mineral wool industry, stack emissions containing condensed fumes from the molten material, sulfur dioxide, and fluorides as well as blow chamber and curing oven emissions consisting of fumes, oil vapors, binding agent materials, and up to 90% wool fibers must be contained with. The asbestos industry is faced with the twin threats of asbestosis and lung cancer as a result of asbestos dust in which a fiber thickness of 0.01 micron is fairly common. The current threshold limit value of 5 million particles per cu ft of air for a daily 8-hr exposure, 40 hrs per week is thought by some to be too high. The importance of controlling dust in the manufacture of silica brick was pinpointed in a Pennsylvania Dept. of Health report in 1939 revealing that 51.9% of 1035 workers examined had silicosis. The threshold limit value of airborne dust as set by the American Conference of Governmental Industrial Hygienists is a function of the silica content. In a dust containing 5% free SiO₂, the TLV is 25 mppcf, but in a dust containing 45% free SiO₂, the TLV is only 5 mppcf. For amorphous silica, the TLV is 20 mppcf.

APTIC-19177

INITIAL COLLECTION EFFICIENCY OF DRY CLOTH FILTER.

(Kanshiki rofu firuta no shoki hoshukoritsunitsuite). Text in Japanese. Funtai Kogaku Kenkyu Daishi (J. Res. Assoc. Powder Technol., Japan), 7 (2):124-130, April 1, 1970. 9 refs.

Norio Kimura, and Koichi Iinoya.

Identifiers: *Efficiency, *Filters, Japan, Aerosols, Operating variables, Particle size, Flow rates.

The collection mechanism of aerosol particles at the initial period of cloth filtration was experimentally determined. A monodispersed aerosol was produced by a LaMer type apparatus having an evaporation and reheating chamber where the temperature was automatically controlled. A dry cloth filter sample was fixed by a rubber packing to a 80 mm id flange. A constant flow of air was maintained. Aerosol density in the upper and lower stream of the filter was monitored by a permeability meter of the light scattering type, measured as

an electrical current. The monodispersion property and mean diameter of particles was optically monitored by a 'HOTS' apparatus, the so-called Owl. Experimental results obtained are presented as a correlation between the initial collection efficiency of an isolated thread and a modified inertial parameter. If the particle size is much smaller than the opening size of a woven cloth, the collection mechanism of the particles is almost due to the inertial impaction. In a short-fiber cloth filter, because of the feather-like fibers in the texture, some particulates are collected at a low speed region. With the increase a flow rate, however, collection of particles by inertial impaction becomes predominant, as is the case with a long-fiber cloth filter. The collection efficiency does not depend on the structure and material of a filter cloth.

APTIC-19194

FOREIGN PARTICLE SEPARATOR FOR AN AIR MOVING MEMBER.

(Boeing Co., Seattle, Wash.) U. S. Pat. 3,513,641. 9p., May 26, 1970. (Appl. Aug. 22, 1968, 5 claims).

Robert P. Hooper, and Vernon L. Arne.

Identifiers: *Collectors, *Design criteria, Settling particles, Aircraft, Gas turbines, Pressure.

A separator is described for removing foreign particles from an airstream which is adapted to provide a continuous untortured flow path for the particles. The problem of ingested foreign particles, including moisture, is universal to all types of gas turbine usage, but the problem is particularly troublesome in helicopter applications. A satisfactory separator must provide maximum separation with a minimum of pressure loss, which is here obtained by angling the trap passageway and disposing the entrance of the trap which received the particles so that it faces the entering air. This apparatus also utilized a bounce plate to direct the heavier particles such as birds which fall from the entering air due to gravity and the downwash of the helicopter into the entrance of the trap. The entrained moisture is directed into the trap before it has an opportunity to touch or contact any other portion of the air inlet. Results of this arrangement are immediate and consequently the formation of ice is also avoided. Tests have resulted in approximately 87% of all particles being separated from the air flowing into the power plant without any secondary flow, a power loss of about 0.6% and a pressure loss of approximately 0.3%.

APTIC-19206

A COMBUSTION CHAMBER CONCEPT FOR CONTROL OF ENGINE EXHAUST AIR POLLUTANT EMISSIONS.

Combust. Flame, 14 (1):155-158, Feb. 1970. 3 refs.

Henry K. Newhall, and Ibrahim A. El-Messiri.

Identifiers: *Internal combustion engines, *Automotive emission control, *Design criteria, Engine exhausts, Operating variables, Air-fuel ratio, Timed fuel injection, Engine design modification, Hydrocarbons, Carbon monoxide, Nitric oxide (no).

The design and operation of an internal combustion engine which controls hydrocarbon, carbon monoxide, and nitric oxide emissions are discussed. The primary chamber, which comprises 65-85% of the total clearance volume, is separated from the engine cylinder by a dividing orifice. A fuel injector supplies fuel to the primary chamber; no fuel enters the secondary chamber. Air is drawn into the engine cylinder through the intake port during the inlet stroke of the operating cycle. During the compression stroke, the air is compressed, and flow through the orifice from the secondary to the primary chamber occurs. At an intermediate point in the compression process, fuel is injected into the primary chamber; toward the end of the compression stroke, it is ignited by a spark plug, located near the dividing orifice. As the flame propagates into the primary chamber, thermal expansion forces high-temperature rich-mixture combustion products into the cool air in the secondary chamber. Thus, NO formation is

suppressed, and complete oxidation of CO and hydrocarbons is promoted. Engine power output is controlled by throttling the inlet air supply. At part-load throttle settings, typical of vehicle road-load operation, NO concentrations were below 100 ppm. The maximum value observed for hydrocarbons was 50 ppm, and under all conditions, the CO concentration was less than 1%.

APTIC-19316

AN ANALYSIS OF ADSORPTION MECHANISM OF SULFUR DIOXIDE BY ACTIVATED CARBON.

Trans. Soc. Heating, Air-Conditioning, and Sanitary Engrs. (Japan), vol. 7:51-59, 1969, 9 refs. Masakatsu Hiraoka, Yoshizo Matsuno, and Tetsuo Hanakawa.

Identifiers: *Adsorption (general), *Reaction mechanisms, Carbon black, Japan, Particle size, Diffusion, Surface properties.

The equilibrium relationship between sulfur dioxide and particles of activated carbon was determined at 20, 30, and 60 C. The results were fitted to a Freundlich-type equation. Adsorption rates of SO₂ into a bed of activated carbon were measured by a transient method in which the total volume of gas is absorbed in a 5% solution of hydrogen peroxide and titrated to obtain the accumulated concentration. Break-through curves were obtained by the differentiation of the curve of the accumulated concentration versus time and were compared with the theoretical results. Analysis of the data indicates that the external diffusion is the controlling factor at the initial state of adsorption and the pore diffusion process is the controlling factor at the final stage of adsorption for particles larger than 0.1 cm.

APTIC-19324

FILTER AND ELECTROSTATIC PRECIPITATOR IN REEL FORM.

(Assignee not given.) U. S. Pat. 3,513,633, 9p., May 26, 1970, 19 refs. (Appl. Sept. 7, 1967, 1 claim).

James O. Glorvig.

Identifiers: *Electrostatic precipitators, *Filters, *Design criteria, Particulates.

A device which acts both as a mechanical filter and an electrostatic precipitator is described. It consists of strips of metal, alternately wide and narrow, alternately charged positive or negative, wound reel-fashion around a drum. The wide strips project out beyond the narrow ones, and particles tend to be stopped by these projections. The particles that do get by the projections are filtered by the field between the strips. The filter is relatively inexpensive, can be taken apart easily yet is rugged enough to withstand high differential pressures, and can be manufactured in a variety of sizes. Previous filters require periodic backflushing to remove trapped or clogged particles. The mechanism described never needs to have the flow reversed for cleansing purposes, thus increasing its effective operating time.

APTIC-19330

THE ADSORPTION OF GASES BY METALLIZED SILICA GELS.

J. Phys. Chem., vol. 31:88-101, 1927, 6 refs. L. H. Reyerson, and L. E. Swearingen.

Identifiers: *Drying, *Metals, *Adsorption, Copper, Platinum, Methanes, Ethylene, Hydrogen, Silver compounds, Carbon dioxide, Carbon monoxide, Oxygen.

The adsorption of gases upon silica gels metallized with silver, copper, platinum, and palladium were measured at temperatures of 0, 64.5, 100, 138, and 218 deg. The apparatus consisted of an adsorption bulb connected to a mercury manometer, and a water-jacketed gas-measuring burette, all connected to an evacuating system. Hydrogen is adsorbed appreciably more upon the copper, platinum, and palladium treated gels, while carbon

monoxide is specifically adsorbed by all the metallized gels except copper. Oxygen is very specifically adsorbed by the copperized gel. The other metallized gels also exhibit specific adsorption for oxygen. There appears to be no marked specific adsorption of the gels for methane. The metallized silica gels all adsorb ethylene more strongly than does silica gel. The adsorption of carbon dioxide gives little evidence of a specific effect, except perhaps in the case of copper. (Author summary modified)

APTIC-19387

DUST EMISSION CONTROL, STEEL WORKS (BROWN SMOKE) OXYGEN-BLOWN STEEL PROCESSES, CONVERTER.

(Staubauswurfbegrenzung Stahlwerksbetrieb (Brauner Rauch) Sauerstoffaufblasverfahren, Konverter). VDI (Ver. Deut. Ingr.) Richtlinien, no. 2112, June 1966, 36 refs. Translated from German by H. Schneider, Israel Program for Scientific Translations, Jerusalem, 12p. CFSTI: TT 68-50469/6

Personal Author Not Recorded.

Identifiers: *Dusts, *Control equipment, *Oxygen converters, Steel, Germany, Furnaces, Primary metallurgical processing, Operating variables, Electrostatic precipitators, Filters, Scrubbers, Equipment criteria.

The advantages of using oxygen for steel production have led to the development of a number of new metallurgical processes, one of the most important being the oxygen converter process wherein oxygen is blown on a metal bath that is charged into the converter from a blast furnace or cupola. Dust in converter gases is generally known as 'brown smoke'; it consists mainly of vaporized iron oxides and manganese oxides, as well as vaporized slag components. Measures to be applied during the blowing period in the converter and designed to reduce the emissions of brown smoke by modification of charge compositions or converter operation are unfeasible with one exception. To keep dust emissions within desirable limits, converter waste gases must be cleaned. Three collectors discussed are filters, electrostatic precipitators, and wet scrubbers. The operating factors influencing the separation efficiencies of these methods are noted. To be suitable for the process, the collectors should have an efficiency of 98%. It is further recommended that each converter be provided with its own waste gas stack from which gases are led by a cooling unit to the collector. Oxygen-blown converter plants should also be equipped with stack flares to insure the ignition of CO-containing waste gases.

APTIC-19403

THE MECHANISM OF WET TYPE ROASTING OF PYROLOTITE.

Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), vol. 58:952-959, 1955, 8 refs. Translated from Japanese. Belov and Associates, Denver, Colo., 32p., May 4, 1970.

Tetsuo Inaba, and Kazuo Kono.

Identifiers: *Iron compounds, *Sulfides, *Reaction mechanisms, *Roasting, Japan, Primary metallurgical processing, Sulfur oxides control, Sulfur dioxide, Hydrogen sulfide, Steam, Reaction kinetics, Thermodynamics.

The reaction kinetics and mechanisms for the reaction of pyrolotite (FeS) and steam are considered both theoretically and on the basis of laboratory experiments. The heat of dissociation for FeS and H₂S are derived, as are the dissociation temperatures. When FeS reacts with steam, H₂S is produced as a pseudo-zero order reaction. Then the H₂S dissociates as a first order reaction or as the sum of a first and second order reaction and SO₂ gas is produced. When reaction time is short, the second order reaction is of little consequence. Sulfur is produced at the low-temperature point of the system. Therefore, roasting of pyrolotite with steam should be conducted using large amounts of steam and a low flow rate to maintain equilibrium within the system.

APTIC-19404

RADIOACTIVE CONTAMINATION IN WORKSHOPS AND LABORATORIES. VOLUME II. COLLECTIVE PROTECTION TECHNIQUES.

Commissariat à l'Energie Atomique, Saclay (France), Groupe Chimie et Effluents, Rept. SPR/67-558, 1967, 78 refs. Translated from French by E. M. Gillis, Atomic Energy Research Establishment, Harwell (England), Information Branch, 92p., 1968. CFSTI: PB 185821-T

J. P. Perotin, and B. Werderer.

Identifiers: *Control methods, *Radioactive radiation, Retention, France, Stacks, Filters, Adsorption, Height finding, Diffusion, Plume behavior, Convection (atmospheric), Flow rates.

Studies and experiments are reported relative to the general properties of radioactive contaminants and the characteristics of atmospheric contamination. The control of atmospheric contamination was approached from the point of view of localizing contamination and conducting it through controlled channels to a point where it can either be collected or diluted sufficiently prior to its releases to the atmosphere to eliminate any possibility of external contamination. The physical and chemical contamination of surfaces is also discussed, along with measures for their prevention.

APTIC-19407

ORGANIC ELECTROLYTE BATTERIES.

Army Electronics Command, Fort Monmouth, N. J., Proc. Conf. Power Sources, 21st Annu., 1967, p. 45-51, 4 refs. (May 16-18.)

H. N. Seiger, S. Charlip, A. E. Lyall, and R. C. Shair.

Identifiers: *Electric propulsion, *Automobiles, Operating variables, Storage batteries, Design criteria, Electrical properties, Voltage.

The design and operating characteristics of two organic electrolyte batteries, the lithium-nickel halide battery and the bipolar nickel-cadmium battery are described, along with a concept for their use in parallel as a hybrid power source for personal passenger vehicles. In the parallel hybrid battery system, the lithium battery supplies the current for cruising and part of the amperes for acceleration. The acceleration requirements in excess of the lithium battery's capability is supplied by the bipolar battery up to 450 amperes, at 1 volt/cell. The bipolar battery can be recharged from the lithium battery during the idling and cruising periods to prepare for the next acceleration demand. The lithium battery would be recharged from an external power source capable of supplying 180 volts at 60 amperes. The parallel operation of the two systems presents a practical approach to the requirements for both range and acceleration performance in a vehicle.

APTIC-19447

CASCADE SCRUBBER HANDLES SUSPENSIONS.

Chem. Eng., 53 (12):224, Dec. 1956.

J. C. Driskell.

Identifiers: *Solids, *Cascade scrubbers, Baffles, Scrubbers, Experimental equipment.

An experimental scrubbing tower is described that will circulate liquid-solid mixtures in addition to straight liquids. The scrubber itself serves as a reservoir for the absorbent, and the pump for the circulation of the absorbent is an integral part of the scrubber. The absorbent is withdrawn from the bottom of the tower through a central draft tube and discharged radially onto a cascade of annular baffles. As it returns to the foot of the tower, the absorbent flows countercurrent to the rising stream of gas. The 75-mm long shell of the scrubber is borosilicate glass; the internal parts, including the 22-in. long draft tube, are stainless steel. In a study involving acidic gases and scrubbing liquids containing abrasive minerals, the scrubber was immersed in a constant-temperature

water bath, and operated continuously, for periods as long as a month. Performance was satisfactory. APTIC-19450

DUST COLLECTORS FOR BOILER FIRED WITH ASH-RICH HARD COAL.

(Entstaubungsanlagen an Dampfkesseln mit Feuerungen fuer ascherreiche Steinkohle). Text in German. Technik Forschung, 11 (48):171-172, 1968.

Juergen Toeile.

Identifiers: *Electrostatic precipitators, Germany, Dusts, Boilers, Design criteria, Emission standards.

The Technical Directives for the Maintenance of Clean Air have set maximum allowable dust concentrations of 0.5 g/standard cu m (long term operation), for waste gases from boilers and of 0.15 g/standard cu m for each newly built plant. For boilers fired with pulverized hard coal, high-efficiency electrostatic precipitators with a collection efficiency of 99.7% must be installed to meet these limit values. Any design of electrostatic precipitators must take into account the dust quantity in the gas flow to be cleaned, particular properties of the dust and gas, primarily the electric conductivity of the dust and its tendency to agglomerate, the temperature of the waste gas, its moisture and sulfur trioxide content. A horizontal version of the precipitator is used for such plants with two separate rapping devices for the primary and secondary dust collection zones. The most favorable rapping rhythm must be experimentally determined in each individual case. APTIC-19453

AIR POLLUTION AND THE PROBLEM OF SULPHUR IN FUELS.

Bank of New York Letter, 1967: 8p., Aug. 1967. Samuel H. Woolley.

Identifiers: *Federal governments, *Standards, *Sulfur oxides control, Regulations, Maximum allowable concentration, Fuel standards, Urban areas, Particulates, Coal, Natural gas, Residual oils, Nuclear power plants, Steam plants, Desulfurization of fuels, SO₂ removal (combustion products), Hydrocarbons, Nitrogen oxides, Sulfur dioxide, Sulfur compounds.

The emphasis on sulfur as the principal source of air pollution is criticized. Quoting responsible testimony to the effect that no evidence exists to substantiate that concentrations as high as 5 ppm are harmful to healthy humans even on a 40 hr/week basis, it is suggested that the H.E.W. imposed maximums of 0.5 ppm may retard the war on air pollution by draining off unnecessary technological dollars to attain an unrealistic sulfur goal at the expense of other significant pollutants such as particulates, hydrocarbons, and nitrogen oxides. Desulfurization of coal and oil are examined, as are conversion to natural gas and atomic power as means to obtain the levels directed by H.E.W. All show promise, but none can meet the H.E.W. established timetables. Two questions are posed which appear to require answers. Are regulations as severe as those proposed by H.E.W. necessary to reduce the health problem of air pollution in the New York-New Jersey area? Will an intermediate objective produce faster and more effective results? APTIC-19456

NEW PROCESS STABILIZES IN THE FORM OF SULFURIC ACID THE SULFUR OXIDES CONTAINED IN SMOKE.

(Nouveau procede valorisant sous forme d'acide sulfurique les oxydes de soufre contenus dans les fumees). Text in French. Ann. Genie Chim., 1967:159-161. (Presented to the Congr. Intern. du Soufre, Toulouse, 1967.)

J. A. Rauscher, H. Acton, and R. F. Barut.

Identifiers: *By-product recovery, *Sulfur oxides control, *Sulfuric acid, France, Great Britain, United States, Stack gases, Fly ash, Steam plants, Catalytic oxidation.

A new process for recovering sulfuric acid from sulfur oxides present in smoke from steam-generating stations consists essentially in removing the fly ash content of the flue gas from the boiler. About 90% of the SO₂ is next oxidized to SO₃ by passage through beds of vanadium catalyst. The flue gases are then cooled by heat exchange with combustion air, causing a weak sulfuric acid mist to form. The mist is collected by a high-efficiency Brink-Mist eliminator. The acid can be solid as produced or concentrated, depending on the acid strength collected and the requirements of the market. After treatment, the gases exhausted to the atmosphere contain 0.01 to 0.03% SO₂. Estimates are that a 500,000 kw power plant will produce 500 tons per day of 100% sulfuric acid at a concentration of 78%. Investments for such a plant will be 15-30% the cost of the power plant. APTIC-19480

MECHANISM AND OPTIMUM CONDITIONS FOR THE OXIDATION OF SULFUR DIOXIDE ON VANADIUM CATALYSTS.

For primary bibliographic entry see Field 06. APTIC-19481

EFFICACY OF FUNGICIDES, HOT WATER AND GAMMA-IRRADIATION FOR CONTROL OF POSTHARVEST FRUIT ROTS OF PAPAYA.

Plant Disease Rept., 53 (4):279-284, April 1969. 17 refs.

J. E. Hunter, I. W. Buddenhagen, and Evelyn S. Kojima.

Identifiers: *Fruits, *Plant damage, Fungi, Control methods, Butanes, Amines, Water, Gamma radiation, Temperature.

The incidence of postharvest fruit rots of papaya was reduced approximately 50% by 2-minute dips in a 2-aminobutane carbonated solution (1% active material) at 40°C, pH 10.5; or by fumigating with 2-aminobutane for 2 hours at 300 ppm. Higher rates resulted in better control but fruits failed to degreen evenly. Significantly better control was obtained by submerging fruits in water at 118-120°F for 20 minutes. Similar water treatment at 114-116 failed to control rots. Gamma-irradiation treatment (75-100 krad), alone or in combination with hot water or 2-aminobutane, effectively extended fruit shelf-life but had limited fungistatic effect. Higher levels of irradiation were injurious to fruits. Rhizopus fruit rot was controlled with 2,6-dichloro-4-nitroaniline dips at 1000-2000 ppm. (Author abstract) APTIC-19538

PROCESS FOR THE REDUCTION OF SULPHUR DIOXIDE TO ELEMENTAL SULPHUR BY MEANS OF CARBON.

(Consolidated Mining and Smelting Co. of Canada, Ltd., Montreal (Quebec)) U.S. Pat. 2,102,081. 6p., Dec. 14, 1937. (Appl. Jan. 14, 1936, 9 claims).

Robert Lapscoe.

Identifiers: *SO₂ removal (combustion products), *Reduction, Carbon black, Canada, Stack gases, Coke, Furnaces, By-product recovery, Temperature.

A process for reducing sulphur dioxide to elemental sulphur by means of carbon is described. The process involves introducing SO₂ into a reducing fluid bed, such as coke, at a high initial temperature which permits the substantially instantaneous establishment of the reducing reactions and then, by effecting a positive control over the temperature of the reactions, to maintain them within a temperature range which will bring them to completion within a minimum of time, thus permitting the operation of the furnace at its highest capacity by avoiding the progressively higher temperatures which would normally result. Advantages of this process include greatly increasing the furnace capacity, eliminating trouble due to hot zones, and improving heat capacity. APTIC-19556

RECOVERY OF SULFUR DIOXIDE FROM GASES AND PRODUCTION OF AMMONIUM SULPHATE.

(Texas Gulf Sulphur Co., New York) U.S. Pat. 2,810,627. 10p., Oct. 22, 1957. 16 refs. (Appl. Feb. 26, 1953, 14 claims).

Henry F. Johnstone, and William E. West Jr.

Identifiers: *By-product recovery, *Absorption (general), Stack gases, Scrubbers, Oxygen, Sulfates, Sulfites, Oxidation, Heat transfer.

A process which successfully recovers sulfur dioxide in a practical and economically feasible manner from waste gases containing up to about 3% by volume of SO₂ is described. The process involves the absorption of SO₂ by an ammonium sulfite compound and the oxidation of the ammonium sulfite compound in the solution with elemental oxygen, resulting in the formation of ammonium sulfate. The oxidation method of this reaction has distinct advantages as compared with the treatment of effluent scrubber solutions with sulfuric acid. In addition to significant economic savings, substantial savings regarding heat supply are realized as a result of the exothermic nature of the reaction. APTIC-19572

ANALYSIS OF INFORMATION OBTAINED FROM THE JAPANESE O.E.C.D. DELEGATES AND THEIR ASSOCIATES REGARDING DESULFURIZATION OF MINERAL OILS AND STACK GASES. (SIC).

Organization for Economic Cooperation and Development, Paris (France), Rept. RC (69)-12, 71p., April 2, 1969. 26 refs.

Alf H. Grennard.

Identifiers: *Fuel oil preparation, *SO₂ removal (combustion products), Japan, Sweden, Stack gases, Residual oils, Petroleum refining, Blending, Hydrodesulfurization, Manganese dioxide (japanese), Hydrogen, Hydrogen sulfide, Catalysts, Hydrogenation, Research programs, Costs, Federal governments.

The Japanese methods of removing sulfur from flue gases and residual fuel oils are discussed. Methods for desulfurizing stack gases include the Active Manganese Oxide Process and the Active Carbon Process. The development of stack gas desulfurization processes that will remove 90% or more of the sulfur in the flue gases are being investigated. There are essentially five methods in use to produce low sulfur fuel oils: selective blending of fuel oil components; conversion of high sulfur residuums by coking; vacuum gas oil hydrodesulfurization; desasphalted oil hydrodesulfurization; and direct residuum hydrodesulfurization. The RCD Isomex Process, the H-Oil Process, fixed bed catalyst processes, and catalyst ebullition processes for hydrodesulfurization are discussed, along with hydrodesulfurization costs. A comparison is made between Japanese and American hydrodesulfurization processes, and the Japanese government's involvement in desulfurization programs is discussed. APTIC-19646

IMPROVEMENTS RELATING TO THE REMOVAL OF SULPHUR DIOXIDE FROM GASES.

For primary bibliographic entry see Field 03. APTIC-19652

METHOD OF PRODUCING SULPHUR FROM GASES CONTAINING SULPHUR DIOXIDE.

(Exploration (A. G.) Co., Ltd., London (England)) Brit. Pat. 525,730. 8p., Sept. 3, 1940. (Appl. Feb. 27, 1939, 10 claims).

Cyril Thomas Hill.

Identifiers: *By-product recovery, *SO₂ removal (combustion products), Charcoal, Great Britain, Combustion gases, Dusts, Coke, Operating variables, Control equipment, Centrifugal separators, Sulfur compounds, Sulfides, Carbon disulfide, Catalysts, Reduction, Condensation, Temperature.

A method is described for the reduction of gases containing sulfur dioxide by traversing a mass or column comprising carbonaceous material at any temperature, even at 1000 C or higher resulting in the production of sulfur. The mass or column may be composed in part of lump refractory material inert under the conditions of reaction, whereas the carbonaceous material may be introduced either as finely divided material or in the lump form. Coke is the most suitable material for the process, but charcoal may also be used. Gases obtained by suspension roasting usually carry considerable quantities of dust which will consist chiefly of metal oxide that can react with sulfur in the presence of carbon to give oxides of carbon and reform the metal sulfide. A cyclone dust extractor may be used to prevent these dusts from reaching the reduction chamber where the oxide dust can cause slagging or fritting and loss of sulfur. If the temperature of the gases entering the reduction chamber is much below 1000 C, it is necessary that they contain a proportion of oxygen which by reaction with carbon will raise the temperature to that required for effective reduction. The mass or column may conveniently be supported on a table which is not in the gas stream, so that the table and that part of the mass or column adjacent to it are relatively cool. Withdrawal of lump material may be effected by a rake, chain grate, or a rotating grate, which moves over the table. The time of contact required will vary with the concentration of sulfur dioxide in the gases, the extent of surface of carbonaceous material presented to the gases, and more particularly with the temperature of the gases. To recover the elementary sulfur in the liquid form, the temperature must be reduced first to 35-400 C in a cooler which may be in the form of a waste heat boiler, then in a separate condenser to about 130 C. It may be desirable to catalytically treat the exit gases to cause reaction between the remaining sulfur dioxide and the small quantities of carbon oxysulfide and carbon disulfide which may be present.

APTIC-19653

SESSION ON POWER TECHNOLOGY. RESEARCH ON ELECTRIC PROPULSION.
Army Electronics Command, Fort Monmouth, N. J., Proc. Conf. Power Sources, 21st Annu., 1967, p. 96-99, 45 refs. (May 16-18.)
R. E. Hopkins.
Identifiers: *Electric propulsion, *Gas turbines, Research programs, Costs, Fuel cells, Vehicles, Design criteria.

The Army's research program on electric propulsion for vehicles is discussed. Because of the influence of weight on the power required for propulsion, the gas-turbine is considered to be the only rotating power source suitable for electric propulsion. Directly connected turbine generators, where the generator revolves at turbine shaft speed, were constructed and tested. The resulting weight is 2.5 lbs/horsepower. Of the new or advanced power sources, the fuel cell appears to have the most potential. At a rated load, the turbine generator has a conversion efficiency of 20%; the fuel cell has an efficiency of 35%. A fuel cell is not affected by altitude pressure changes as is the turbine generator. The major barriers to using a fuel cell are the fuel processing equipment to enable the use of hydrocarbon fuels and the cost which is dependent on the type of catalyst used. Much progress has been made in the static solid state conversion of electrical power. The military interest in this type of conversion results from its very high efficiency and the flexibility it gives to vehicle control and utilization. Based on preliminary knowledge and commercial acceptance of electric propulsion, it is predicted that electric propulsion will have a military future.

APTIC-19655

SESSION ON VEHICLE PROPULSION BATTERIES. ZINC-AIR BATTERIES.
Army Electronics Command, Fort Monmouth, N. J., Proc. Conf. Power Sources, 21st Annu., 1967, p. 51-54, 2 refs. (May 16-18.)
Anthony M. Moos, and Nigel I. Palmer.

Identifiers: *Electric propulsion, *Design criteria, Engine design modification, Zinc compounds, Oxygen, Electrolysis, Electric charge.

The zinc-air battery, which offers promise of meeting the functional and economic requirements of the electric car, is discussed. It is regarded as a hybrid fuel cell/storage battery where one-half of the electrochemical couple, zinc, is stored in the battery, while the other half, oxygen, is taken from the surrounding air and electrocatalytically reduced to a non-consumable electrode. The basic cell consists of a porous zinc anode, impregnated with aqueous potassium hydroxide electrolyte, that is surrounded by a porous separator and contained in two hydrophobic air cathodes that are electrocally connected in parallel. Cycle life must be provided for in the primary zinc-air battery, at this time, a 50% depth of discharge appears to be a maximum for useful cycle life. An average discharge current of 32 mA/cu m favors a high cycle life. Production of zinc dendrites during the charge can be reduced by using ceramics or plastics between the cell plates. Charging rate, method of charge, anode thickness, and quantity of electrolyte are other factors affecting zinc dendrite growth and anode life. An improved feature of the zinc-air battery is the ability to remove and replace the anode after discharge, providing an extra degree of freedom to the designer and offering a number of alternate operating modes.

APTIC-19660

PROCESS OF PRODUCING ELEMENTAL SULPHUR.
(Koppers Co., Inc., Monroeville, Pa.) U. S. Pat. 2,413,714. 8p., Jan. 7, 1947. (Appl. April 30, 1942, 13 claims).
William O. Keeling.
Identifiers: *S₂ removal (combustion products), *Catalysts, *Reduction, Combustion gases, Scrubbers, By-product recovery, Hydrogen sulfide, Oxidation, Cooling, Liquids, Pressure, Temperature.

Elemental sulfur can be produced by reacting a volume of sulfur dioxide with twice its volume of hydrogen sulfide. However, this reaction exhibits a high degree of reversibility at elevated temperatures. According to an improved process, gaseous H₂S and SO₂ react under pressure at temperatures of 300 to 750 C, in the presence of a suitable catalyst, until the reaction reaches equilibrium to produce elemental sulfur. The reaction products are flowed into direct contact with a water spray. The water causes the sulfur to condense so that it can be recovered in liquid form. Residual gases are passed into a gas and liquid contact device where they are contacted with water containing an excess of dissolved SO₂. All residual H₂S is converted to elemental sulfur, which is mixed with the condensed sulfur, melted, and removed. Any other residual H₂S and SO₂ gases are vented from the system, or can be reused in the process.

APTIC-19665

PRODUCTION OF SULFUR.
(General Chemical Co., New York, N. Y.) U. S. Pat. 1,919,342. 7p., July 25, 1933. (Appl. July 9, 1931, 26 claims).
Henry F. Merriam.
Identifiers: *Absorption (general), *Sulfur dioxide, *Reduction, Furnaces, Sulfur compounds, Catalytic activity.

Production of elemental sulfur is described from gas mixtures containing sulfur dioxide, oxygen, and gaseous impurities obtained from roasting or smelting furnaces. The process comprises contacting a gas containing sulfur dioxide with an absorbing agent, removing SO₂ from the absorbing agent by means of a reducing gaseous medium, and reacting the SO₂ and reducing gas in the presence of a catalyst to form sulfur. In order to accomplish substantially complete reduction of the sulfur, it was formerly necessary to employ reducing agents in sufficient quantities not only to reduce the SO₂, but also to combine with the free oxygen contained in the gas mixtures. The primary advantage

of the process described is its production of sulfur using minimum amounts of reducing agents, thus saving considerable expense.

APTIC-19666

PROCESS FOR THE RECOVERY OF SULPHUR.
(Assignee not given.) Brit. Pat. 427,999. 2p., May 3, 1935. (Appl. June 12, 1934, 4 claims).
Axel Rudolf Lindblad.
Identifiers: *S₂ removal (combustion products), *Reduction, Sweden, Slack gases, Natural gas, Pulverized fuels, Furnaces, Catalysts, Condensation.

A method for recovering sulfur from the waste gases of pyritic smelting furnaces is described. The gases containing sulfur dioxide are contacted with a reducing agent, such as natural gas, vaporized petroleum, or finely divided carbon. The reducing agent should be introduced in the upper part of the shaft furnace at a suitable distance from the charge. It is mixed with the gases immediately after they have left the charge and are as hot as possible. The reducing reaction occurs rapidly, and usually before the gaseous mixture leaves the upper part of the furnace chamber. Minor quantities of carbon disulfide, carbon oxysulfide, and hydrogen sulfide are often formed. To attain a complete and perfect recovery of sulfur it is necessary to pass the hot gases and reducing agent through a contact chamber. Ordinary brick coated with an alkali metal compound as catalyst, such as sodium carbonate, can be used as the contact agent. The gases are then passed to a condenser where they are cooled and sulfur is recovered as a liquid or a solid.

APTIC-19667

IMPROVEMENTS IN OR RELATING TO THE REMOVAL OF SULPHUR COMPOUNDS FROM WASTE GASES.
(Simon-Carves Ltd., Stockport (England)) Brit. Pat. 947,640. 2p., Jan. 22, 1964. (Appl. April 19, 1960, 3 claims).
John Stanton Gerrard.
Identifiers: *Absorption (general), *Hydrogen sulfide, Great Britain, Kilns, Scrubbers, S₂ removal (combustion products), Ammonia, Sulfur compounds.

The removal of sulfur dioxide and hydrogen sulfide from the waste gases of a Claus kiln is described. The waste gases are passed through two scrubbing towers disposed in series. An aqueous ammonia solution is passed through the towers countercurrently to the gas flow. Thiosulfate is formed in the second tower, into which the ammonia solution is first passed. The ammonia solution is then passed to the first tower where it contacts the incoming waste gas and absorbs H₂S and some SO₂. Reactions occur in the first tower which lead to the breakdown of the thiosulfate and to the formation of polythionates and the precipitation of sulfur. The first tower operates under more acid conditions than the tower where the aqueous ammonia solution enters. Due to this, the major part of the absorption can occur in the tower first entered by the waste gas, and absorption will be in a molar ratio of H₂S:SO₂ approaching 2:1. An additional tower may be included on the exit side of the waste gas stream. Water is passed to the gas countercurrently through this tower to give the gases a final aqueous washing.

APTIC-19668

METHOD OF RECOVERING SULPHUR FROM GASES.
(Assignee not given.) Brit. Pat. 358,851. 2p., Oct. 15, 1931. (Appl. April 11, 1931, 4 claims).
Stanley Isaac Levy, and Charles Leaver.
Identifiers: *Sulfur compounds, *Carbon disulfide, *Oxidation, Great Britain, Iron oxides, Sulfur dioxide, Oxygen, Catalysts, Condensation, Heat transfer, Temperature.

A method of recovering sulfur from gases containing carbon disulfide and carbon oxysulfide is described. High sulfur yields may be obtained if these gases are contacted with oxygen or an oxygen-containing gas. The necessary reaction conditions are secured by contacting the gases with a refractory material, impregnated with ferric oxide, and maintained at a temperature of 800-900 C. Air or sulfur dioxide may be used as the source of oxygen. The air or SO₂ should be admitted to the reaction chamber independently of the sulfur-containing gases to avoid explosion. The exit gases from the reaction vessel are conducted to condensers where they are cooled to the temperature at which sulfur is deposited as a liquid. Any sulfur passing through the condensers may be collected in suitable precipitators. Thus, exit gases may be obtained which are substantially free of sulfur and sulfur compounds.

APTIC-19669

A CYCLIC PROCESS FOR THE REMOVAL OF OXIDES OF SULPHUR FROM WASTE GASES.

(Assignee not given.) Brit. Pat. 438,582. 2p., Nov. 19, 1935. (Appl. June 26, 1935, 6 claims).

William Carrick Anderson.

Identifiers: *SO₂ removal (combustion products), Great Britain, Combustion gases, Coal, Coke, Fuel oils, Gasolines, Furnaces, Absorption (general), Hydrogen, Magnesium compounds, Sulfates, Cooling, Temperature.

A method of removing sulfur dioxide from the waste gases of furnaces in which coal, coke, oil, and gas are burned is described. The cooled gases are contacted with a suspension or solution of magnesium sulfate in water. The SO₂ is converted to magnesium sulfite and a small proportion of magnesium sulfate. Thus, the SO₂ becomes fixed in the solution and the purified gases escape. It is preferred that the gases be contacted with the magnesium solution by passing them through or over screens of absorbent material. The screens are kept moistened by dipping them into the solution or by spraying. The magnesium sulfate and sulfite remain dissolved and may be separated by crystallization. The magnesium sulfate is dehydrated and heated with 25% of its weight of carbon to a red heat in a hydrogen-containing atmosphere. This treatment causes a reaction which liberates sulfuretted hydrogen and regenerates the magnesium. The gases containing sulfuretted hydrogen are passed into a magnesium bisulfite solution. Elemental sulfur is precipitated out and can be separated by filtration or settling. Small amounts of polythionate and polythionic acids remain in solution.

APTIC-19670

PROCESS FOR THE RECOVERY OF SULPHUR FROM SULPHUR DIOXIDE.

(General Chemical Co., New York, N. Y.) U. S. Pat. 1,836,357. 7p., Dec. 15, 1931. (Appl. Nov. 2, 1927, 5 claims).

Raymond C. Benner, and Alfred Paul Thompson.

Identifiers: *Sulfur dioxide, *Reduction, Coal, Coke, Carbon dioxide, Carbon monoxide, Oxygen, Sulfur compounds, Condensation, Temperature.

A process for reducing sulfur dioxide to elemental sulfur is described. A mixture of SO₂, in an amount not greater than 12%, and oxygen is contacted with a fuel, such as coal or coke, at an elevated temperature. The proportion of the SO₂ and oxygen are regulated by the addition of air so that substantially all of the carbon is used to produce carbon monoxide. Sulfur dioxide gas is added to the gaseous products of the reduction reaction to provide interacting proportions of reducing and reducible gases. This SO₂ gas is richer in SO₂ and poorer in free oxygen than the gas entering the reduction chamber. The interaction of the reducing gases and the SO₂ forms elemental sulfur, water, carbon dioxide, and CO. The products are cooled to as low a temperature as possible without causing condensation of the sulfur, and passed to a catalytic chamber. The ele-

mental sulfur is then condensed and collected. If the residual gases contain any sulfur compounds, they may be contacted with activated carbon to remove the last traces of these compounds and any elemental sulfur present.

APTIC-19672

PROCESS FOR RECOVERING ELEMENTAL SULFUR FROM SULFUR GASES.

(Assignee not given.) U. S. Pat. 1,169,726. 7p., Jan. 25, 1916. (Appl. Feb. 8, 1915, 3 claims).

William F. Lamoreaux.

Identifiers: *Sulfur dioxide, *Reduction, Coke, By-product recovery, Design criteria, Sulfur compounds, Condensation, Heat transfer, Temperature.

The reduction of sulfur dioxide to elemental sulfur by contacting the gas with coke is described. Previously, the heat necessary to cause reduction of SO₂ was supplied by an electric current. In this process, the heat is supplied to the SO₂ before contacting it with the bed of incandescent carbon. A complete reduction of SO₂ to sulfur can be obtained by heating the gas to 1200C or higher by passing it through a bed of glowing coke. The gas is initially preheated to compensate for any temperature deficiency due to endothermic reactions, radiation, or other losses in the reaction zone. The heat, otherwise wasted in the gases leaving the furnace, is conserved for the preheating operation in a recuperative furnace. After the reduction reaction, the gas is removed to a suitable condenser where the elemental sulfur is collected. This process is well suited to areas where electrical energy is not available or is very costly.

APTIC-19673

RECOVERY OF SULPHUR FROM SULPHUR DIOXIDE.

(Assignee not given.) U. S. Pat. 1,840,076. 3p., Jan. 5, 1932. (Appl. April 6, 1927, 4 claims).

Raymond F. Bacon.

Identifiers: *Sulfur dioxide, *Reduction, Collectors, Hydrogen, Sulfur compounds, Catalysts, Steam, Pressure, Temperature.

The reduction of sulfur dioxide to elemental sulfur by contacting the gas with hydrogen is described. No reaction occurs below 500 C, and the reaction proceeds slowly until higher temperatures are reached. If oxygen is also present in the reacting gas mixture, the temperature required for reaction between SO₂ and hydrogen is so high that reaction will also occur between oxygen and hydrogen. Reaction between SO₂ and hydrogen can be promoted by a catalyst such as elemental sulfur, and hydrogen reacts with SO₂ at temperatures as low as 200-250 C. The process involves subjecting the SO₂ to the action of hydrogen at a temperature not exceeding 500 C, and preferably at about 250 C, in the presence of elemental sulfur. Steam or water vapor may be present in the reacting gases, and the presence of copper or iron promotes the reduction reaction. The sulfur collecting in the reaction zone may be periodically removed, and the sulfur suspended in the exit gases may be collected by electrostatic precipitation, cyclones, or bag houses. Increases in pressure have a favorable effect on the reaction, and agitation of the reacting gas mixture is advantageous.

APTIC-19674

PROCESS OF RECOVERING SULPHUR FROM SULPHIDE MINERALS.

(Texas Gulf Sulphur Co., Houston) U. S. Pat. 1,904,481. 4p., April 18, 1933. (Appl. May 13, 1930, 2 claims).

Nils Erik Lenander.

Identifiers: *Sulfur compounds, *Recombination, *Reduction, Europe, Combustion gases, Dusts, Fumes, Coke, Furnaces, Electrostatic precipitators, By-product recovery, SO₂ removal (combustion products), Iron compounds, Oxides, Carbon monoxide, Carbon disulfide, Hydrogen sulfide, Catalysts, Oxidation, Condensation, Temperature.

A process for recovering elemental sulfur from sulfide minerals, such as pyrites, is described. The pyrites are smelted with coke and flux in a closed shaft furnace to which oxidizing gas is introduced. The products are a molten slag and matte, elemental sulfur vapor, sulfur dioxide, hydrogen sulfide, carbon oxysulfur, and carbon disulfide. The gases are withdrawn from the furnace and passed through a dust chamber and an electrostatic precipitator to remove any dust and fumes. The cleaned gases are passed through a catalyst chamber at a temperature of about 400 C. Suitable catalysts are metallic oxides, such as bauxite or mixtures of metallic oxides. In the chamber the gaseous and volatile sulfur compounds react with each other forming elemental sulfur. The gaseous products are cooled to condense and recover the elemental sulfur. The residual gases are heated in the presence of an oxidizing gas to convert the sulfur and sulfur compounds to SO₂, which is passed through an absorbing medium.

APTIC-19675

ORGANIC BASES FOR GAS PURIFICATION.

Ind. Eng. Chem. 23 (5): 501-504, May 1931. 3 refs. R. R. Bottoms.

Identifiers: *Absorption, *Carbon dioxide, *Hydrogen sulfide, Fuel gases, Bubble towers, Design criteria, Alcohols, Organic nitrogen compounds, Amines, Steam, Pressure.

The absorption of hydrogen sulfide and carbon dioxide from fuel gas and industrial gases by organic nitrogen compounds is discussed. The ethanalamines were found to be the most satisfactory compounds due to their high specific absorption capacity and their low cost. For the absorption of H₂S and CO₂, a 50% water solution of di- or triethanolamine has been found satisfactory. The absorber consists of a standard hubbler tower, containing bubble trays fitted with a number of bubble caps. Gas enters the base, passes up under the caps, and the solution is pumped into the top, flows downward, and absorbs the impurities. Pressure in the tower forces the liquid through the tower outlet, through the heat exchanger, and piping, and to the reactivator tower. As it passes down the reactivator tower, the solution increases in temperature and is scrubbed by steam. When it reaches the bottom, the solution is completely stripped of the absorbed CO₂ and H₂S. The solution is then pumped through the heat exchanger and cooler, and completes its circuit at the top of the bubble tower. Strong mineral and organic acids and strong alkalis must be eliminated from the gases, since they have a damaging effect on the ethanalamine solutions. This process can be used to remove CO₂ from natural gas, from hydrogen for use in ammonia synthesis, in the separation of H₂S from natural gas, refinery gas, bake-oven gas, and manufactured gas.

APTIC-19676

METHOD OF MAKING CARBON DISULFIDE.

(Dow Chemical Co., Midland, Mich.) U. S. Pat. 1,350,858. 2p., Aug. 24, 1920. 1 ref. (Appl. July 15, 1918, 7 claims).

Herbert H. Dow, and Charles J. Strosacker.

Identifiers: *Carbon disulfide, *Recombination, Coke, Absorption, Carbon dioxide, Carbon monoxide, Sulfur dioxide, Oxygen, Temperature.

A method of producing carbon disulfide from sulfur dioxide and carbon is described. Previous methods have involved passing sulfur vapor over coke, or heating pyrites with carbon. However, these processes have not gone into commercial use or been successful in practice. For SO₂ to react with carbon, it is necessary to supply additional heat because of the endothermic nature of the reaction. It has been found that a sufficient temperature can be maintained by including a small amount of oxygen with the SO₂. The gas is led into a suitable chamber, preferably a tumbling barrel with a refractory lining, in which a body of coke has been placed and brought to dull, red heat. Sulfur dioxide will react with the coke to form CS₂ and some carbon monoxide. The oxygen also

unites with the coke in an exothermic reaction to produce carbon dioxide. As a result, the coke is maintained at the required reaction temperature, and the reaction continues until all the coke is used. The CS₂ and CO₂ are continually withdrawn; the CS₂ is absorbed from the gas and then distilled from the absorbent.
APTIC-19677

PRODUCTION OF SULPHUR FROM SULPHUR DIOXIDE.

(Imperial Chemical Industries, Ltd., London (England)) U. S. Pat. 1,908,873. 3p., May 16, 1933. (Appl. June 10, 1931, 1 claim).
Daniel Tyrer.
Identifiers: *Sulfur dioxide, *Reduction, Great Britain, Coal, Coke, Sulfur compounds, Heat of combustion.

The production of sulfur from sulfur dioxide by reduction with carbon at a high temperature is described. High temperature coke had been used as a reducing agent, but it has been found that low temperature coke, or semi-coke, offers advantages due to its greater activity. Thus, reaction temperatures lower than with high temperature coke, or from 600-800 C., may be used. Heat of the reduction gases also may be used to carbonize coal, and thus produce semi-coke for the reduction process. The reduction of SO₂ by semi-coke may be conducted in any suitable manner. The gas may be passed through a bed of lump semi-coke which has been externally heated or heated by the passage of sulfuriferous gas and air. Granular or pulverized semi-coke may also be used. The gas may be forced through a bed of the material so as to cause a turbulent motion, or the pulverized semi-coke may be dispersed in the SO₂ and the mixture exposed to a high temperature.
APTIC-19678

RECOVERY OF SULPHUR.

(Assignee not given.) U. S. Pat. 2,040,682. 4p., May 12, 1936. (Appl. Dec. 7, 1931, 1 claim).
Raymond F. Bacon, and Wilber Judson.
Identifiers: *SO₂ removal (combustion products), *Oxidation, *Reduction, Combustion gases, Coke, Furnaces, Iron compounds, Iron oxides, Sulfur compounds, Catalysts, Temperature, Volatility.

A method is described for reducing to elemental sulfur the sulfur dioxide produced in the roasting of finely divided sulfide ores. The interior of the furnace is preheated to 850 C. or above so that the pyrites will be ignited. The pyrites and finely divided coke are passed into the furnace counter-currently to a flow of oxidizing gas. The amount of coke used should be theoretically sufficient to reduce the SO₂ produced by oxidation of the fixed sulfur atom of the pyrites. The air or oxidizing gas is provided in an amount sufficient to oxidize the fixed sulfur of the ore to SO₂ and the iron to iron oxide. In the upper part of the furnace the pyrites and coke are subjected to the action of rising heat, and the sulfur atom of the pyrite is volatilized. The temperature in this zone is maintained at 600-700 C., and since the atmosphere is non-oxidizing, the volatile sulfur will be discharged in the elemental state. In the reducing zone, the iron sulfide exists as iron monosulfide, and the coke is substantially used up. In the oxidation zone, the iron monosulfide is contacted with the air and intense oxidation occurs, resulting in the production of iron oxide and SO₂. The exit gases are sent to a dust collector and then to a catalytic chamber to recover any additional sulfur.
APTIC-19679

REDUCTION OF SULPHUR DIOXIDE.

(Assignee not given.) U. S. Pat. 1,880,741. 3p., Oct. 4, 1932. (Appl. May 12, 1928, 13 claims).
Maitland C. Boswell.
Identifiers: *Sulfur dioxide, *Catalysts, *Reduction, Canada, Hydrogen, Cobalt compounds, Iron compounds, Nickel compounds, Sulfur compounds, Hydrogenation, Water, Temperature.

A method of catalytically reducing sulfur dioxide to elemental sulfur is described. The catalyst used in this process may be an oxide, sulfate, or sulfide of iron, cobalt, or nickel. The SO₂-containing gas is mixed with hydrogen in the proportion of one volume of SO₂ to two volumes of hydrogen. The mixed gases are passed over the catalyst at a temperature of 300 C. The catalyst does not assume its maximum activity at once, but only after it has been in use for some hours. Water and molten elemental sulfur are the products of the reaction. When the mixture of SO₂ and hydrogen is passed over the catalyst, water is formed without the corresponding amount of sulfur. This condition is maintained for only a few minutes, after which the reaction results in the complete transformation of all the SO₂ and hydrogen into sulfur and water. Thus, the active catalyst formed and contained sulfur.
APTIC-19680

THE OXIDATION OF SULPHUR DIOXIDE OVER MOLTEN SALTS.

Ann. Genie Chim., 1967:215-217, 1967. 11 refs.
A. R. Glueck, F. P. B. Holroyd, and C. N. Kenney.
Identifiers: *Catalytic oxidation, *Sulfur dioxide, *Reaction kinetics, Great Britain, Combustion gases, Absorption (general), Sulfur trioxide, Catalytic activity, Reaction mechanisms, Thermodynamics.

The kinetics of the oxidation of sulfur dioxide by oxygen over vanadium pentoxide catalyst to give sulfur trioxide have been subject to much research, but the mechanism of the reaction under industrial conditions is still not satisfactorily explained. Kinetic experiments on the oxidation of sulfur dioxide over molten potassium pyrosulfate containing vanadium pentoxide to yield sodium trioxide are discussed. The rate of reaction is first order in sulfur dioxide and zero order in oxygen partial pressure. The velocity constant is 10 to the minus 7th power moles/(sq cm)(atm)(sec) at 380 C and the activation energy is 20 k cal. Possible mechanisms are given. The rate of absorption of SO₂ into a melt was also studied. (Author abstract modified)
APTIC-19681

CONDENSATION OF SULPHURIC ACID.

Ann. Genie Chim., 1967:52-61, 1967. 12 refs.
A. G. Amelin.
Identifiers: *Contact processing, *Sulfuric acid, *Condensation, USSR, Mists, Chemical processing, Filters, Gases, Vapors, Supersaturation.

The process of sulfuric acid condensation is complicated by several concurrent processes which are specific for the production of sulfuric acid. Therefore, proper corrections should be introduced into average calculation formulae. Moreover, sulfuric acid vapor is easily condensed in volume, forming a stable mist which causes great difficulties in production processes. When a vapor-gas mixture contacts a colder surface, two independent processes occur simultaneously: cooling of the gas and condensation of the vapor. The rates of these processes are in such a relation that at the beginning, vapor oversaturation increases, reaches the maximum value, and then goes down. When oversaturation reaches the critical value, the vapor condenses in volume forming nuclei which later increase because of condensation growth. While considering the process of vapor condensation on the surface, it is necessary to differentiate strictly between conditions before and after mist formation. In the first case, the process of condensation can be calculated according to well-known formulae, in the second case a stage-by-stage method of calculation is used. The results of investigations show that the necessary data are available for establishing such condensations under which the formation of mist can be eliminated. However, this is usually connected with the decrease of condensation process rate. Therefore it often appears very profitable to conduct the process at high rates with the formation of larger drops of mist and then to remove that mist

in filters. Minimum material expenses for the realization of the process are determined by vapor condensation on the surface and by the conditions of mist evolution in filters. (Author abstract modified)
APTIC-19682

THE LATEST AIR CLEANERS.

(Salkin no kukiseljoki). Text in Japanese.
Mitsubishi Denki Gihō (Tokyo), 44 (4):525-531, April 1970. 4 refs.
Yoshiki Arai, and Kenichi Hirayama.
Identifiers: *Sulfur dioxide, *Particulates, *Filters, Japan, Colorimetry, Maintenance, Ventilation, Design criteria.

For air pollution consisting of very fine particles and harmful gases which include sulfur dioxide, the traditional type of air cleaners are no longer sufficient, especially in the ventilation system of a building. In addition, the trend to smaller numbers of personnel for the maintenance and management of buildings calls for cleaners that are concurrently more labor-saving. In 1968 the FD-type electrostatic dielectric filter was developed by Mitsubishi, the FD-B-type filter has recently been developed with further improvements. The Mitsubishi air cleaner is introduced under the general trade mark of "Clean air" and consists of many different models. The characteristics of each model is tabulated according to intake velocity, flow rate, dust collection rate (colorimetric and AFT weight method), air resistance, particle size, maximum dust concentration, maintenance, and advantages and disadvantages. Specifications for the model FD-B filter are given in terms of size, direction of flow, collection rate (colorimetric), effective duct velocity, flow rate, filter material, power source, drive mechanism, power consumption, and DC-HV source. Structural analysis, electrical circuitry, filter construction, characteristics of corona discharge, and plots of collection efficiency versus air capacity are diagrammed, and various uses of the filter are suggested.
APTIC-19688

SIMULTANEOUS REMOVAL OF FLY ASH AND SO₂ FROM GAS STREAMS BY A SHAFT-FILTER-SORBER.

Environ. Sci. Technol., 4 (8):663-667, Aug. 1970. 7 refs.
Raymond L. Zahradnik, Josephat Anyigbo, Richard A. Steinberg, and Herbert L. Toor.
Identifiers: *Fly ash, *Sulfur dioxide, *Shaft-filter-sorber, Filters, Alkalized alumina (adsorption), Mathematical analyses, Gases.

A shaft-filter-sorber consists of a bed of slowly falling sorbent pebbles through which the gas stream to be cleaned passes horizontally. As determined by a series of experiments with alkalized alumina as the sorbent, this method has a 99+% filtration efficiency for SO₂ at gas mass velocities of 150 lb/hr sq feet and dust loadings in excess of 3 grains per scf. The high filtration efficiency indicates that sorbent pebble filters can be used to remove fly ash while simultaneously removing gaseous SO₂. The SO₂ removal is predictable on the basis of static bed experiments, and a design curve based on this prediction is presented as a means of projecting removal efficiencies at higher gas velocities. (Author abstract modified)
APTIC-19714

PROCESSES FOR RECOVERING SULFUR FROM SECONDARY SOURCE MATERIALS.

Bureau of Mines Information Circ., no. 8076, 1962, 62p. 561 refs.
B. K. Shabler, and M. W. Hovey.
Identifiers: *By-product recovery, *Sulfur compounds, Natural gas, Industrial emission sources, Petroleum refining, Core ovens, Electric power production, Mineral processing, Paper manufacturing, Petroleum production, Primary metallurgical processing, Sulfur oxides control, Sulfuric acid.

A literature survey on processes for recovery of elemental sulfur and sulfur compounds from secondary source materials is presented, and the more important processes from all non-Frasch sources are described. The text consists of concise descriptions of the general nature of the recovery processes and definitions of major differences between processes proposed for treating the same or similar materials. The bibliography represents the available English language literature on the subject through 1958, with emphasis on the period 1950-1958. In addition to several articles and publications containing general information on sulfur, the text and bibliography on processing methods are arranged under the six principal sources of secondary sulfur, as follows: volcanic sulfur, including all elemental sulfur deposits not adaptable to the Frasch mining process; hydrogen sulfide as found in sour natural gases, petroleum refinery products, and coke-oven gases; sulfur dioxide from the roasting and smelting of metal sulfide ores and from power plant waste gases; pyrite and pyrrhotite obtained by mining mineral deposits or produced as by-products from the concentration of sulfide ore; gypsum and anhydrite occurring as deposits of calcium sulfate; and industrial wastes containing sulfates, sulfites, and sulfuric acid, such as those produced in the steel, paper, and petroleum industries. (Author summary modified) APTIC-19733

A STUDY OF THE EFFECTS OF ELECTRIC WIND IN AN ELECTROSTATIC PRECIPITATOR.

Preprint, Air Pollution Control Association, New York City, 28p., 1969. 16 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 62nd, New York, June 23, 1969.) O. E. Ramadan, J. J. Stukel, and S. L. Soo. Identifiers: *Electric winds, *Electrostatic precipitators, *Smokes, *Kerosene, *Photometric methods, *Smoke meters, *Flow rates, *Ionization, *Ions, *Gases, *Electrical properties, *Corona, *Electric charge, *Voltage.

Electric wind in an electrostatic precipitator or the movement of gas induced by the repulsion of ions from the neighborhood of a high voltage discharge electrode was investigated. This included the measurement of secondary flow or electric wind velocity by a smoke tracer method and the measurement of density distribution of smoke particles by a photometer. The electric wind was emitted from each corona wire toward each of the collector plates in the form of jets; velocities increased with the corona voltage. Measurements were made on an elemental passage of a conventional electrostatic precipitator of 6-in. passage height and 3-in. spacing of corona wires along the center of the passage. Particles entrained in the air consisted of a 7-micron kerosene smoke. Flow velocities ranged from 5 to 15 fps, and corona voltages ranged from plus or minus 20-40 kV. The electric wind was influenced by the electric Reynolds number and the momentum transfer number, while the magnitude of maximum jet velocity of electric wind from the corona wire may be higher than the mean flow velocity. Comparison of theoretical (without electric wind effect) and measured results of density distribution and collection rate of particles is strongly influenced by the presence of electric wind. The electric wind promotes fluctuation in density of the particles and causes reentrainment of particles near the wall. If the electric wind effect can be suppressed or better utilized, much smaller precipitator dimensions would be feasible. APTIC-19743

POSSIBILITIES TO IMPROVE THE EFFECTIVENESS OF DUST SUPPRESSION METHODS.

(Möglichkeiten zur Verbesserung der Wirksamkeit von Staubbekämpfungsverfahren). Text in German. Gluckauf (Essen), 106 (7):309-321, April 2, 1970. Hans-Dieter Bauer.

Identifiers: *Silicosis, *Dusts, *Centrifugal separators, *Wetting, *Occupational health, Germany, Mining.

The number of mining workers afflicted with silicosis has been drastically reduced in the past few years. This is mainly due to the practice of intensive water infusion. Dust measurements taken before and after use of this method have verified its high efficiency. Through additives to the water, such as calcium chloride and wetting agents, the dust binding efficiency can be greatly increased as tests have shown. Potassium chloride proved to be an efficient tracer. Use of small-sized dust collectors in the mines also helped to bring down the number of silicosis cases. The most remarkable unit of this kind is the so-called Rotovent dust collector which operates as follows: an underpressure is produced in the air intake duct of the dust collector by expanding compressed air which comes from an annular slot with 1.5 times the speed of sound. The dust-laden air is drawn in and set into motion, and the dust particles thrown to the wall collide with the expanding compressed air at the annular slot. Into the turbulence developing at this point water is injected, resulting in an intense contact between the solid and liquid phase. About 0.1 liter water/cu m air drawn into the turbulent zone were needed. APTIC-19799

EQUIPMENT FOR THE CLEANING OF WASTE GASES.

(Einrichtung fuer die Reinigung von Abgasen). Text in German. (Aktiebolaget Bahco, Stockholm (Sweden)) Swiss Pat. 480 860. 6p. Nov. 15, 1969. (Appl. Aug. 21, 1968, 4 claims.) Karl-Axel Goeran Gustavsson. Identifiers: *Absorption, *Combustion gases, Sweden, Control equipment, Design criteria, Hydroxides, Calcium compounds, Sodium hydroxide.

Equipment for the cleaning of waste gases was devised, consisting of a suitable reservoir to hold a certain quantity of absorption fluid with a gas inlet arranged so that the gas is forced to move downward toward the surface of the fluid. An absorption column beginning immediately above the surface of the absorbent raises vertically upward. The absorbent container is connected with a second smaller absorbent container which is equipped with a device to maintain a constant absorbent level in the large container. The smaller absorbent chamber is connected with the gas outlet of the droplet precipitator or has an outlet into the atmosphere. A second stage consisting likewise of an absorbent container and column with a smaller chamber for balancing the absorbent level may be operated parallel to the first stage if desired. In this case the second container for balancing the absorbent level is arranged above the first one with an overflow leading to the lower container. The absorbent level is automatically regulated as a function of the gas throughput. Sodium lye and calcium hydroxide can be used as absorbents. The absorbent containers have a cylindrical upper section and a conical lower section; the absorption column is arranged coaxially to the absorbent container. The height of the column is larger than the diameter of its inlet opening. The upper end of the column reaches into a cylindrical chamber arranged coaxially to the column which serves as the droplet precipitator; it has a gas outlet and a fluid outlet. APTIC-19800

METHOD FOR THE REMOVAL OF SULFUR DIOXIDE FROM GASES OR GAS MIXTURES BY ABSORPTION AND APPLICATION OF THE METHOD.

(Verfahren zur absorptiven Abscheidung von Schwefeldioxyden aus Gasen oder Gasgemischen und Anwendung des Verfahrens). Text in German. (Carl Stoll, Recklinghausen (W. Germany)) Swiss Pat. 480 862. 4p., Nov. 15, 1969. (Appl. Dec. 20, 1966, 12 claims.)

Josef Schmidt, Heinrich Weber, Wilhelm Schmitz, Rudolf Brosch, and Dieter Laufhaette.

Identifiers: *Absorption (general), *Combustion gases, *Metal compounds, Germany, Fly ash, SO₂ removal (combustion products), Hydroxides, Aluminum compounds, Iron compounds, Manganese compounds, Potassium compounds, Sodium compounds.

A method was devised for the removal of sulfur dioxide from industrial gases by absorption on dry metal hydroxides. Hydroxides of iron, aluminum and manganese, as well as of the alkali metals such as sodium and potassium, are suitable absorbents. They are used in a dry pulverized form without any preliminary treatment. Furthermore, it is feasible to use mixtures of various metal hydroxides, or mix the metal hydroxides with other substances, e.g., carrier substances. Residual matter from the combustion of solid fuels can also be employed, while the use of ashes is particularly advantageous because a waste product can find reuse. The gas which is to be cleaned may be passed through a stationary bed of the absorbent in a tower or it may be passed through a fluidized layer. Several absorbents are connected consecutively, and the last is always filled with fresh absorbent. Absorption takes place preferably at temperatures between 130 and 170 °C, but no separate heating or cooling is required if the gases should have temperatures below and above that range. The advantage of this method is that the dew point of the gases is not markedly increased. A gas with an SO₂ content of 5.7 g was cleaned to a residual content of 0.2 g in 6.6 g CA (OH₂) forming a layer of 100 mm. APTIC-19802

THE BISCHOFF-VERFAHREN.

(Das Bischoff-Verfahren). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:121-127, 1970. G. Hausberg.

Identifiers: *Dusts, *SO₂ removal (combustion products), *Scrubbers, Costs, Germany, Fumes, Electric power production, Design criteria, Pressure.

Problems of waste-gas purification occasioned by ever-increasing production quotas for electric power plants call for new research on the removal of dust and sulfur dioxide. Plant economics demands a process which simultaneously removes SO₂ and particulate pollutants, requiring a new investigation of the use of wet processes, previously neglected because of the threat of draft loss and increased maintenance costs resulting from the clogging of equipment that accompanies such processes. Tests were conducted early in 1968 on a two-stage scrubber, 5,000 cu m/hr throughput capacity, used in conjunction with a power plant boiler. The effect of the scrubbing process was observed for various combinations of fumes and dust. A maximum pressure loss of 300 mm H₂O was observed, and the consumption of scrubbing liquid was held constant. Results indicated that a realistic goal was 80% removal of SO₂ with a dust content of less than 50 mg/cu Nm in the purified gas. A pressure loss in the scrubber of about 250 mm H₂O was considered acceptable. For final test concentrations of 100-150 mg, the pressure loss need be only 150-200 mm. It has been estimated that for dust and SO₂ removal in a 350 MW block, the additional cost is \$0.1 per kWh, depending on the type of desulfurizing material used. Depending on the adjustments made, this process is capable of dust removal to a level less than 100 mg/cu Nm, including the removal of fine dust particles that normally escape as emissions. The SO₂ removal amounts to 80-90% when its concentration in the original flue gas is about 2.5-3.0 g/cu Nm. The flexibility of the apparatus is seen from its rapid adjustment to variable operating conditions, such that a boiler out of operation overnight can be brought up to its full capacity within half an hour, and the equipment is insensitive to load fluctuations. APTIC-19803

DESULFURIZATION OF SOFT COAL.

(Beitrag zur Frage der Entschwefelung von Steinkohle). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:405-411, 1970.

K. Lemke.

Identifiers: *Coal, *Desulfurization of fuels, Germany, Magnetic separation, Iron compounds, Sulfides.

An important mineral component of soft coal is iron pyrite, whose sulfur content (about 53%) is a principal source of the sulfur dioxide content of flue gas, although about 0.8% of the sulfur belongs to organic compounds and cannot be removed by mechanical or electrical processes. Attempts have been made to be more selective in the coal mining process itself, by using coal that has a lower sulfur content, but except in extreme cases such selectivity is not economical. Attention is given to the following factors, in terms of concrete examples: grain size and separability of pyrite; separation of pyrite from middlings; wet and dry processes for separating pyrites from middlings as this relates to the milling of coal for power plant use; the possibilities of separating pyrite by a magnetic process. Pyrite separation from middlings is feasible, provided the content of grains less than 0.06 mm is not too high. The pyrite content of most coal mined in West Germany has a grain size of 0.02-0.6 mm, most of it unbound or loosely bound to the coal itself. The basic problem is one of screening the original particles in such a way as to eliminate a large percentage of pyrite. Experiments with a Franz magnetic separator show that a fuel strength of 14,000 Gauss will remove about 65% of the pyrite from milled samples, and that increased fuel strength does not improve efficiency. When the pyrite is heat-treated at 300 C, 17,000 Gauss are required for complete removal of pyrite from the cooled samples. With a treatment temperature of 300 C, a fuel strength of only 4900 Gauss is required to obtain the same results.

APTIC-19804

A STUDY OF JETS OF ELECTRICALLY CHARGED SUSPENSIONS.

For primary bibliographic entry see Field 06.

APTIC-19805

EXHAUST EMISSION CONTROLS OF U.S.A. AND EUROPE.

For primary bibliographic entry see Field 11.

APTIC-19806

REFINERS CONTINUE ATTACK ON AIR POLLUTION.

Oil Gas J., vol. 58, 12p., Feb. 20, 1961.

D. H. Stormont.

Identifiers: *Petroleum refining, *Control equipment, *Costs, Research programs, Social attitudes, Stack gases, Particulates, Afterburners, Centrifugal separators, Electrostatic precipitators, Air-fuel ratio, Odor counteraction, Hydrocarbons, Mercaptans, Sulfur compounds, Hydrogen sulfide, Hydrogenation.

A survey of 56 petroleum refineries was conducted to determine the extent of their control of serial wastes from their plants. It was estimated that \$12.7 million was spent in 1961 for air pollution control measures, compared with \$22.5 million in 1956. The reason for this decline is that more controls are being designed into new units before they are built. The largest expenditures are for controlling hydrocarbons; sulfur compounds require the second largest outlay, followed by smoke and particulate matter, odors and fumes. Hydrocarbons are controlled by floating roof tankage or vapor recovery systems. The use of hydrogenation units to reduce the olefin content of motor fuel is another high cost control item. Almost all of the cost of sulfur compounds control is in connection with hydrogen sulfide recovery plants. Smokes have been controlled by afterburners and proper air-fuel ratios. Cyclones and electrostatic precipitators are widely used for control of particulates, with cyclones being more economical.

There are several methods for controlling odors and fumes, including the separation and incineration of mercaptans and H₂S from refining wastes. Benefits of air pollution control to the refinery and several research projects conducted by various plants are also discussed.

APTIC-19850

MASS-TRANSFER COEFFICIENTS FOR SO₂ ABSORPTION FROM GASES USING LIME SUSPENSIONS.

(Koeffitsiyenty massopredachi pri pogloshchenii SO₂ iz gazov izvestkovymi suspenziyami). Text in Russian. Khim. Prom. (Moscow), no. 7:67-70, 1962. 8 refs.

B. A. Chertkov.

Identifiers: *Absorption (general), *Flow rates, *Mass transfer coefficients, Limestone, USSR, Pilot plants, Packed towers, Alkaline additives, Transport.

Data from pilot testing of a packed absorber designed for extracting sulfur dioxide from low-concentration gases using lime suspensions are correlated. With an irrigation solution of pH greater than 5, the resistance of the liquid phase becomes negligible while the total coefficient of mass transfer may be equated to the partial coefficient in the gaseous phase. The coefficients of mass transfer vary proportionally to the first-order change in linear gas flow rate. The dependence of the mass-transfer coefficient on pH of the irrigation suspension over the range 5.3-6.3 and on solid particle content over the range 20-32 wt % is plotted.

APTIC-20374

PRINCIPLE AND CONSTRUCTION OF TWO NEW AIR CLASSIFIERS FOR PARTICLE SIZE ANALYSIS.

Powder Technol. (Amsterdam), 2 (3):175-185,

March 1969. 9 refs.

K. Leschonski, and H. Rumpf.

Identifiers: *Particle size, *Centrifugal separators, *Gravity settling, *Design criteria, Europe, Germany, Settling particles, Suspended particulates, Particulate classifiers, Particulate sampling, Fractionation.

The principle and the basic requirements of counter flow equilibrium, transverse flow classification, and the construction of two new air classifiers are described. A gravity counter flow equilibrium classifier was developed. The range of cut sizes lies between approximately 10 to 100 micron. The sharpness of cut is equal to that of known gravity equilibrium classifiers, but the time necessary for one cut is only about one tenth. For the lower cut size range between 2 and 12 micron, a centrifugal transverse flow classifier is proposed. The special feature of this classifier is its very sharp cut at low cut sizes, attained by repeated classification of the coarse product in a transverse flow classification. The construction of both classifiers ensures simple operation. Every part that comes into contact with the dust-laden air can be cleaned, removed or exchanged easily. Special effort has been made to recover the coarse fraction quantitatively and quickly. A prototype of the gravity classifier with accessories is illustrated and a sectional drawing of the centrifugal transverse flow classifier is given.

APTIC-20378

METHOD FOR THE EXTRACTION OF SULFUR FROM HYDROGEN SULFIDE OR HYDROGEN SULFIDE CONTAINING GASES.

(Verfahren zur Gewinnung von Schwefel aus Schwefelwasserstoff oder

schwefelwasserstoffhaltigen Gasen). Text in German. (Metallgesellschaft A. G., Frankfurt (W. Germany)) W. German Pat. 707,132. 7p., May 15, 1938. (Appl. date not given, 8 claims). Max Wohlwill.

Identifiers: *Control methods, *By-product recovery, *Hydrogen sulfide, Germany, Sulfur oxides, Sulfur dioxide, Sulfur compounds.

A method was devised for the extracting sulfur from hydrogen sulfide or gases containing as little as 2% by volume of H₂S. The method is characterized by treatment of these gases with sulfur dioxide in the presence of pure organic bases or mixtures of such bases. Secondary and tertiary amines, preferably aromatic bases alkylated to nitrogen, are used as the reaction liquid, e.g., dimethyl anilin. The reaction takes place above the dew point for water. The temperature in the reaction chamber is so high that all sulfur remains solved. The H₂S containing gas flows parallel to the reaction liquid loaded with SO₂. Upon leaving the reaction chamber, the gases are cooled just to a temperature above the water dew point. The bases precipitated thereby are returned to the process. For regeneration of the various alkaline salt solutions from the final gases, they are combined neutralized with calcium and distilled or mechanically separated. The bases polluted with acid or neutral organic compounds are cleaned by entering them as sulfite or bisulfite into aqueous solution, separating them from the unsolved organic components, and by driving off the SO₂.

APTIC-20379

HERE'S WHAT IS KNOWN ABOUT LIQUID GAS PIPELINES.

Oil Gas Intern., 8 (7):50-53, July 1968. (Presented at the Natural Gas Processors Association Meeting, New Orleans, March 1968.)

D. H. Norrie, and G. Walker.

Identifiers: *Natural gas, *Transportation, *Design criteria, Canada, Compressed gases, Costs.

General aspects of liquefied natural gas (LNG) pipeline design is considered in terms of construction costs, maintenance, expansion, liquefaction techniques, and safety devices. The need for LNG pipelines for remote-area transport, marine transport, and offshore well operation is anticipated. Results, reported by E. Carbonnelli, et al., in 'The Transport of LNG by Pipelines: Technical and Economic Aspects' are reviewed. Economic feasibility of LNG pipelines is regarded as still unsettled and their further development and utilization is expected to be gradual.

APTIC-20382

CONSTRUCTION AND OPERATION OF FIRST MIDWESTERN LNG PEAK SHAVING PLANT.

Can. Gas J., vol. 58:8-12, Dec. 1965.

Personal Author Not Recorded.

Identifiers: *Natural gas, *Design criteria, *Liquefaction plant, Operating variables, Compressed gases.

The first U. S. commercial LNG (liquefied natural gas) storage plant, being built at a cost of \$2 million at Oak Creek, Wisconsin, is described in detail. Designed to serve 100,000 customers, this facility will operate four propane-air peak shaving plants with a total capacity of 8000 MMcf/d. The key unit in this plant is the 72,000 bbl double-walled storage tank. The inner tank is all aluminum and the outer tank, carbon steel; the intermediate space is insulated with expanded perlite and purged with nitrogen. A boil-off of 0.07% is anticipated for full capacity at maximum ambient temperature (95 F). Liquefaction is designed for gas containing 10% nitrogen and 0.5% carbon dioxide at an inlet pressure of 155-315 psig, with a net fill rate of 0.75 MMcf/d. Water and CO₂ are removed from the feed gas by dual bed molecular sieves. Sendout and control systems are also briefly described.

APTIC-20383

THE COLLECTION OF SILICA FUME WITH A VENTURI SCRUBBER.

J. Air Pollution Control Assoc., 4 (3):155-158,

Nov. 1954. 10 refs.

J. E. Yocum, and S. Chapman.

Identifiers: *Electric furnaces, *Venturi scrubbers, *Design criteria, Fumes, Pilot plants, Particle size, Silicon compounds, Costs.

Pilot-scale venturi scrubbers were tested with respect to their application in the control of silica fume emissions from ferrosilicon furnaces. The unit consisted of a venturi nozzle of 2.5 in. throat diameter, a cylindrical separator chamber, and a blower rated at about 500 cfm at 50 in. static pressure. Silica fume collected at relatively high weight efficiencies in a venturi scrubber, but only at the expense of substantial quantities of power needed to create the pressure drop through the unit. Efficiencies between 52 and 90% were obtained over a pressure-drop range of 5 to 47 in. of water gauge. Particle-size studies of inlet and outlet samples indicate that the relatively large particles (up to 7 micron) were collected selectively, with the greatest collection at the highest pressure drops. The fume particles in the size range between 0.01 and 0.4 micron were collected uniformly at all pressure drops; i.e., no one size class within this range was collected selectively. Cost estimates for a commercial venturi scrubber in this application showed that the capital investment as compared with other collector types was low. Operating expenses, on the other hand, were high and reflected the high power requirements. (Author conclusions modified)

APTIC-20386

CONTROL OF ATMOSPHERIC EMISSIONS IN THE WOOD PULPING INDUSTRY. VOLUME 3. (FINAL REPORT).

Environmental Engineering, Inc., Gainesville, Fla., and Sirrine (J. E.) Co., Greenville, S. C., Contract CPA 22-69-18, 250p., March 15, 1970. 4 refs. CFSTI: PB 190353

E. R. Hendrickson, J. E. Roberson, and J. V. Koogler.

Identifiers: *Kraft pulping, *Measurement methods, *Research programs, *Costs, Measurement, Analytical methods, Sampling methods, Mathematical modeling.

Chapters 9 through 13 are contained in this third and final volume of a study of control of wood pulping emissions. Chapter 9, which includes 237 references, reviews sampling and analytical techniques, grouped under emission source or ambient conditions, for kraft, sulfite, and NSSC pulping processes. For each grouping, recommendations are made of the best available procedures. An annotated bibliography of 174 papers related to on-going research in pulping emissions control comprises Chapter 10; references are grouped under eight subjects. Recommendations for future research and development are made in Chapter 11. Chapter 12 presents estimates of present pulping industry investment and operating costs for emissions control. The cost analyses are based on prices of chemicals and equipment as of Jan. 1969. Chapter 13 reports the development of a model which provides data applicable for projections of investment and operating costs for emission control in the kraft pulping industry through 1980. A sensitivity analysis suggests how the costs for emission control are influenced by emission standards, value of recoverable chemicals, and assumed rate of return. A mathematical programming model is also presented, by which it is possible to determine for any specified mill the optimal way to satisfy specified emission standards and maximize net revenue from emission control. An example is analyzed with the model, using the 1969 Oregon regulations and based on Jan. 1969 prices.

APTIC-21724

ENGINEERING ANALYSIS OF EMISSIONS CONTROL TECHNOLOGY FOR SULFURIC ACID MANUFACTURING PROCESSES.

Contract CPA 22-69-81, 276p., March 1970. CFSTI: PB 19093

Personal Author Not Recorded.

Identifiers: *Contact processing, *SO₂ removal (combustion products), *Sulfuric acid, Acid smuts, Combustion gases, Fumes, Operating variables, Stacks, Process modification, Absorption (general), Adsorption (general), Design criteria, Costs.

The capabilities and state of development of the available processes and devices to effect control for both existing and new plants were evaluated to determine the cost of control by various methods, and to outline programs for further development of systems which appear to have the greatest overall potential for reducing undesirable emissions from sulfuric acid plants in the United States at the lowest cost. Existing plants can reduce their emissions somewhat by modifying their operating conditions with little capital expenditure, but this control is limited to about 2000 ppm of sulfur dioxide. Present technology can achieve a control effectiveness of 500 ppm of SO₂ via the dual absorption route, and excellent acid mist control in the order of 0.1 mg/SCF. No fully developed acid plant control systems are commercially operated in the U. S. which achieve an effectiveness of 100 ppm of SO₂, but there are promising ones in various stages of development. It is doubtful that there is any contact plant in the U. S. to which some type of control system could not be applied to reduce emissions to less than 500 ppm SO₂, but to do so economically may be a different story. Cost of emission control varies widely with plant capacity, type of control system and other factors. Cost of less than 500 ppm SO₂ control for a 250 T/D contact plant varies from about \$75 to over \$3 per ton of acid. Mist control costs vary from \$.02 to \$.35/tons of acid. These costs are predicated on an assumption that promising processes will work as expected. Control cost is lower for large plants. Recommended areas for study include development of resin and molecular sieve adsorbents, oxidation inhibitor development for tail gas recovery processes, study of stack dispersion and factors affecting it, plus development work on several processes, both for treatment of tail gas and improved in-plant conversion.

APTIC-21824

REDUCTION OF EMISSIONS AT REFUSE INCINERATORS.

(Emissionsverminderung bei der Abfallverbrennung.) Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:313-317, 1970. H. H. Franke.

Identifiers: *Incineration, *Emission standards, Germany, Odors, Dusts, Electrostatic precipitators, Federal governments.

The heterogeneous nature of refuse material makes any reduction of emissions difficult. Incinerators primarily emit dust (1 to 20 g/cu m), sulfur dioxide and sulfur trioxide (500 to 2500 mg/cu m), hydrogen chloride (150 to 1500 mg/cu m), and odors. The Federal government has imposed emission limits on incinerators, namely 150 mg/cu m of dust for plants with a circulation of 1.5 tons/h, and 200 mg/cu m of dust and a carbon dioxide content of 7% for plants with a capacity below 1.5 tons/h. Technical measures for the reduction of emissions are discussed in the VDI (Association of German Engineers) guidelines 2114 and 2301. High stacks help to reduce high emission concentrations. For flue gas cleaning, the gases must first be cooled to temperatures between 150 and 250 C, while the liberated heat can be used for power generation. If no heat utilization is contemplated, water or fresh air must be used for cooling the gases. Electrostatic precipitators are primarily used for dust separation in large incinerators. In storage bunkers an underpressure must be maintained to avoid spread of disagreeable odors.

APTIC-21882

PROMISE SEEN IN STACK-GAS SO₂ REMOVAL.

Oil Gas J., 64 (18):53, May 2, 1966.

Personal Author Not Recorded.

Identifiers: *SO₂ removal (combustion products), Stack gases, Coal, Fuel gases, Bag filters, Glass fabrics, By-product recovery, Catalytic oxidation, Hydrodesulfurization, Alkaline additives, Sulfuric acid, Sulfur trioxide, Temperature.

The progress of three companies in removing sulfur dioxide from stack gases is reported. The Bab-

cock and Wilcox process involves injecting dolomite, or other alkaline additives, into the hot stack gases and then filtering them through fiber-glass filter bags. Efficiency of sulfur recovery has not been disclosed, but it is believed that this process will prove satisfactory when used on large power plants. The Monsanto process will remove SO₂ from flue gas by oxidizing it to trioxide, and then condensing the latter to sulfuric acid. Based on a 3% weight fuel, the cleaned gases from the precipitator would contain 2000 ppm SO₂ and 20 ppm SO₃. In passing through the catalyst bed, the SO₂ concentration is reduced to 200 ppm and that of SO₃ increased to 2300 ppm. In a rotary air pre-heater, the 600 F temperature drop causes the formation of sulfuric acid mist which is collected and removed as sulfuric acid. About 90% of the stack gas sulfur was recovered at a concentration of 70% sulfuric acid in pilot plant tests. Combustion Engineering's process has not been tested outside the laboratory. However, these tests were encouraging in that the sulfur content of the gases was greatly reduced. It is believed that this process will be confined to large industrial sources due to the expense of the treating equipment. The hydrodesulfurization of residual fuel oils is briefly discussed.

APTIC-22057

UNDERGROUND STORAGE OF LIQUEFIED NATURAL GAS: FIRST STUDIES AND PROJECTS OF GAZ DE FRANCE.

(Stockage souterrain de gaz naturel liquefie: premieres etudes et projets du gaz de France).

Text in French. Preprint, American Gas Association, Inc., New York, 11p., 1962.

(Presented at the Conference of the American Gas Association Boston, Mass., June 4, 1962.) H. Bresson.

Identifiers: *Natural gas, *Compressed gases, *Storage facilities, France, Soils, Operating variables, Design criteria.

The possibilities of importing liquefied natural gas, (LNG) by special transport ships and storing it to take care of contingencies of sea transportation were studied. The storage in surface tanks is unsafe. The recent development of underground storage of liquefied petroleum gas, (LPG) suggested the possibility of extending this technique to low-temperature storage of LNG. Theoretical studies, begun in 1958 were followed by laboratory investigations, then by experiments with small-volume subterranean cavities and culminated in a pilot project for building and operating an underground storage tank at LeHavre, France. In the theoretical studies, analytical solutions of the problems of temperature and thermal stress distributions in the ground surrounding a spherical cavity the walls of which are maintained at the temperature of boiling methane, were obtained. The heat flux into a tank of industrial size results in an acceptably small rate of evaporation of the LNG, even in the absence of heat insulation in the wall; the O C isotherm remains during use of the tank, at such a distance from the walls that freezing of the ground at the surface can be avoided by burying the tank at a reasonable depth (more than 30 m); a very high lateral traction exists at the wall of the cavity which should lead to the formation of radial fissures; the highest stresses are attained in the steady state, so that special filling schedules to maintain the temperature gradient at the wall below a given value appear to be unnecessary. Laboratory investigations were devoted largely to determinations of low-temperature properties of rocks and dry and wet soils.

APTIC-22117

CONTROL OF EXHAUST GAS FROM INTERNAL COMBUSTION ENGINE.

(Nainen-ikikan no haishutsu-gasu no seigyō.) Text in Japanese. Nippon Kikai Gakkai-shi (Journal of the Japanese Society of Mechanical Engineers) (Tokyo), 73 (612):100-111, 1970. 91 refs. Takashi Kohayakawa.

Identifiers: *Automotive emission control, Japan, Engine exhausts, Crankcase emissions, Fuel evaporation, Engine operating cycles, Internal combustion engines, Automobiles, Catalytic afterburners, Flame afterburners, Air-fuel ratio, Smog, Hydrocarbons, Benzene (3-4)pyrene, Carbon dioxide, Carbon monoxide, Nitrogen oxides, Photooxidation.

With respect to the harmful components of exhaust gas from an internal combustion engine (carbon monoxide, hydrocarbons, oxides of nitrogen, lead, sulfur dioxide, aldehyde, and smoke), CO, HC and NOX are discussed with respect to their production mechanisms and controls. The amount of CO gas from the engine is mostly determined by the air-fuel ratio used in the engine; typical concentrations of the CO gas (%) are 3.90, 2.60, 1.85, and 4.30 during idling, acceleration, cruise and deceleration, respectively. The fuel-air ratio should be lowered especially during idling, and the amount of mixed air-fuel gas within the carburetor should be as constant as possible to decrease the CO emissions from the engine. Total HC is composed of 60% exhaust gas HC, 25% crankcase emissions, and at 15% evaporation from the carburetor of fuel tank. The 3-4-benzopyrene which has a tendency to cause cancer at hundreds of ppm is included at 1 to 5 ppm. The mechanisms of producing HC are: diminish of flame suppression by the combustion chamber wall, irregular ignition, misfire and others determined by the conditions of driving and/or engine structure. Typical concentration of the HC gas (ppm) are 730, 610, 390, and 2350 during idling, acceleration, cruise and deceleration, respectively. The nitrogen oxides (NOX) from the internal combustion engine consist of 95% NO and 5% NO₂. The NO is changed to NO₂ by oxidation in air, causing a photochemical smog which disturbs vision or shows harmful effects on human bodies and vegetation. Typical concentrations of NOX (ppm) are 130, 1550, 720, and 220 during idling, acceleration, cruise and deceleration, respectively. Thus it will be quite difficult to decrease these three harmful gases (CO, HC, and NOX) by a simple method. The methods which have been utilized to reduce the production of these gases are improvements of crankcase ventilation, of engine efficiency itself or of recirculation system to lead mixed air-fuel gas (Duplex equipment or Volvo's method) within the engine; and the use of platinum catalyst, air injection pump, direct flame afterburner or manifold reactor outside the engine.

APTIC-22129

ISOGO INCINERATION PLANT IN YOKOHAMA.

(Yokohamashi seisokuyoko isogo kojo ni tsuite). Text in Japanese. Kikichowa Eisei Kogaku (J. Japan Soc. Heating, Air-conditioning, Sanitary Engrs.), 44 (2):131-138, 1970.

Masakata Murakami, Takashi Kawashima, and Kamichiro Kamitsu.

Identifiers: *Incineration, *Design criteria, Yokohama, Soot, Smokes, Boilers, Digesters, Furnaces, Stacks, Centrifugal separators, Electrostatic precipitators, Dispersion.

Equipment and facilities recently installed at Isogo Waste Treatment Plant are described. The site covers 13,141 sq m including a 7330 sq m building site. The plant is comprised on a main building, containing three basements and five floors, a waste dumping building, a furnace wing off the main building, and adjoining structures. The nominal incinerating capacity is 300 t/day with a peak load capacity of 450 t/day to handle seasonal increases. To eliminate the conventional image of waste disposal facilities and to emphasize the modern sanitary working environment, many advanced concepts were incorporated. The use of multi-cyclone and electric dust collectors keeps soot and smoke emissions below 0.1 g/N cu m. Chimneys 85 m tall with exhaust velocities greater than 20 m/s effectively disperse all smoke. The pit chamber is air tight to prevent the discharge of noxious odors. Waste water is treated to meet the

requirements of the Water Quality Standard. At night, noise is suppressed to less than 50 phons. The furnace is operated from a central control room which includes a closed TV monitor system to permit overall supervision of the site activities. In the furnace room, air is recirculated 20 times per hour and 10-15 times per hour in other operating and staff areas. Offices, equipment rooms, control rooms, exhibit rooms, and some others are heated and air-conditioned. Surplus steam from waste heat boilers is used in the sludge digestion tanks. Surplus gas, mostly methane, is used as a subsidiary fuel. To prevent flooding, the first floor was built 5 m above the average tide level of Tokyo Bay.

APTIC-22130

RESEARCH OF SULPHUR OXIDE CONTROL TEST PLANT.

(Hai gas datsoolyu no kaihatsu kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4 (1):70, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th 1969.)

T. Kobayashi, G. Shimada, and M. Yokoi.

Identifiers: *Sintering, *Absorption (general), Steel, Japan, Combustion products, Combustion gases, Dusts, Pilot plants, Primary metallurgical processing, Scrubbers.

A method of sulfur oxides control in waste gas from the sintering process in the steel industry was tested. The gas absorber as developed by Kanagawa Prefecture Industrial Experiment Station was adopted which is a wet-process and uses a comparatively compact device with a higher absorption rate due to its gas-liquid contact mechanism. It is capable of dust removal and was as an absorbent the ammonia generated at the coke producing process. In an experiment using a small test plant, the removal efficiency of sulfur is 90 to 95% for the case using industrial water as an absorbent and more than 98% for ammonia; dust removal efficiency is approximately 90%. In the test of a medium size plant which consists of an absorption tower, a blower, pumps, tanks, demister, a heater, and meters, with an original amount of 800 to 1000 ppm of sulfur dioxide, it becomes 10 to 60 ppm, regardless of pH value, for 20,000 N cu m/hr; less than 100 ppm when pH is more than 7.5, for 30,000 N cu m/hr; and less than 100 ppm when pH is above 9, for 50,000 N cu m/hr. When sea water is used as an absorbent, it becomes below 100 to 300 ppm, depending on the gas load. These data will be used for the design of a larger plant.

APTIC-22138

MEANS OF PREVENTION OF ATMOSPHERIC POLLUTION DUE TO THE HEATING OF RESIDENCES AND TO INDUSTRY.

(Moyens de prevention de la pollution atmospherique due au chauffage des locaux et a l'industrie). Text in French. Pollut. Atmos. (Paris), vol. 12:23-27, May 1970.

Jean-Paul Detrie.

Identifiers: *Stack gases, *Control methods, France, Industrial emission sources, Domestic heating, Stacks, SO₂ removal (combustion products), Combustion.

Too reduce the emissions of pollutants from stoves, and chimneys, improvements in combustion must proceed more rapidly than increases in energy consumption. The heights of industrial chimneys should be measured, and the principle of preservation of green spaces must be respected. Techniques to reduce pollution from combustion and other industrial processes have been successful; their application has already reduced pollutants from ovens and chimneys, as the decline in the sulfur dioxide curve proves. Attention must be given so that this equilibrium is maintained.

APTIC-22149

ATMOSPHERIC POLLUTION AND AUTOMOBILES.

(Pollution atmospherique et vehicules automobiles). Text in French. Pollut. Atmos. (Paris), vol. 12:43-56, May 1970.

Paul Chovia.

Identifiers: *Automotive emission control, France, Engine exhausts, Fumes, Automobiles, Air quality measurements, Time fuel injection, Secondary air, Field tests, Hydrocarbons, Carbon dioxide, Carbon monoxide, Vapors.

Paris contains over one million automobiles at present, and atmospheric pollution from escaping gas is approaching dangerous levels. Aside from carbon dioxide gas and water vapor, carbon monoxide, and certain oxygenated derivatives of hydrocarbons, there exist also the hydrocarbons themselves. These compounds remain unburned and give off the black fumes which escape not only from diesel engines but also from automobile motors. For ten years the Central Laboratory of Police Headquarters in Paris has undertaken the measurement of vehicular pollution levels in order to better assess health hazards from emitted pollutants. As a result of numerous experiments, certain European automobiles already satisfy the requirements for decreased pollution levels, but the majority must still be perfected so as not to exceed the emission levels which have been established. One solution consists in injecting fresh air at the exhaust valves. Another advocates the complete halt of fuel injection into the automobile motor during deceleration phases. A solution found by engineers in Germany concerns 'electronic injection': an electronic calculator regulates the injection of fuel according to a number of fundamentals such as speed, acceleration, and power.

APTIC-22153

DIRECTION OF A VIEW FUTURE: RECIPROCATING ENGINE GAS TURBINE

(Blickrichtung Zukunft: Kolbenmotor Gasturbine) Text in German. Antriebsstechnik, 9 (6):191-193, June 1970.

Otto Herschmann.

Identifiers: *Power sources, *Automotive emission control, Germany, Gas turbines, Diesel engines, Automotive emission control.

In an interview, Dr. Herschmann answered questions concerning the prospects of reducing air pollution due to motor vehicle exhaust emissions by alternative means of propulsion. In the near future, no solution is in sight which would be fully equivalent to the present internal combustion engine. The existing modifications are either operationally inferior or else economically undesirable. Gas turbines have considerably smaller emission rates of hydrocarbons, carbon monoxide, and nitric oxide, but the small sizes needed for passenger-vehicle propulsion can not provide satisfactory efficiency values, while the greater inertia of the required transmissions reduces the acceleration rate of the vehicle. Steam engines and electric motors with storage batteries or fuel cells are at present too weak, too heavy, too bulky, or have too small an energy storage capacity. Gas turbines are inferior to diesel engines even in the case of large vehicles, except when they are used as boosters in conjunction with other power plants. The gas turbine could be used quite efficiently for rail propulsion if electric generators were available that could be coupled directly to the gas turbine. Diesel engines are still capable of notable improvement, such as the use of exhaust-gas turbine supercharging in conjunction with some cooling of compressed air. Exhaust gas composition can also be improved to reduce air pollution.

APTIC-22155

ELECTROSTATIC DUST REMOVAL IN URBAN INCINERATORS AT THE ELECTRICITE DE FRANCE-TIRU PLANT, ISSY-LES-MOULINEAUX.

(Depoussierage electrostatique de l'installation d'incineration des residus urbains a la centrale

E.d.F.-Tiru-Isy-les-Moulineux). Text in French. Tech. Moderne, p. 49-50, Feb. 1970. (Presented at the University Foundation for the Study of Air and Water Pollution Congress on Dust Removal, Lyon, France, April 24, 1969.)

R. Joffre.
Identifiers: *Dusts, *Multiple chamber incinerators, *Electrostatic precipitators, Paper, France, Ashes.

The Isy-les-Moulineux incinerator can handle 500,000 tons per year of garbage and household trash, with an average thermal power of 1500 kcal/kg. It is divided into 4 independent units, each of which is equipped with 2 Lurgi electrofilters and blower that draws the fumes from the 2 filters into a common chimney. The installation is the first of its size to be used in Europe. The dust separators are 98% efficient, receiving waste gases containing 80-360 mg/cu m and emitting gases containing 4-18 mg/cu m. The filters are in a horizontal position, connected in parallel, each with two electrical fields, independent from one another and connected in series, so that in the case of a failure of one field the unit will retain 75% operating efficiency. A major problem in the use of electrostatic filters with incinerators is that fragments of partially burned paper, because of their high carbon content, do not respond to the electrostatic field and escape into the air. Experimental studies have shown that the use of precipitation plates with irregular surfaces is more effective in eliminating the paper ash.

APTIC-22156

COOLING TOWER SITE CONSIDERATION.

Power Eng., 74 (8):49-51, Aug. 1970.

Dean R. De Harpootre.

Identifiers: *Cooling towers, *Plume behavior, *Fog, Electric power production, Diffusion, Meteorology, Winds, Temperature (atmospheric), Inversion, Water, Vapors.

Site selection for a new power plant now requires expert evaluation by a hydrometeorologist of the potential effects of the plant on the environment. No matter what method of cooling heated water is employed, the majority of heat from both nuclear and fossil-fueled plants is transferred to the atmosphere in the latent form through evaporation. When the heated water is cooled by exposure to a large amount of air in a cooling tower, resulting intense evaporation produces a dense cone-shaped fog plume from a few feet to several thousand feet in length. Evaporation over a cooling pond is less intense, but is spread over a much larger area. Polluting agents in the plume and fog are heat and moisture. In selecting a plant site, the hydrometeorologist will first evaluate available meteorological data, and perhaps conduct a field study to determine the effects of topography, inversions, and wind patterns on the path and diffusion of potential cooling tower plumes or pond-induced fog. After the tentative selection of a site, supervises a fully instrumented, on-site study lasting at least one year. Wind, temperature, and humidity data are measured and continuously recorded at several levels of a high tower; if necessary, additional measurements of temperature and wind at higher levels are obtained through balloons and tracer studies. Whether the field studies are limited or detailed, predictive equations are applied to the field data to obtain the extent and frequency of the cooling tower plume or fog from the cooling pond.

APTIC-22159

IMPROVEMENTS OF HEAT EQUIPMENT AND METHODS OF SMOKE AND SOOTS IN THERMAL POWER PLANTS.

(Karyokuhatsudensho netsusetsubi no kaisen to baian tsuaku). Text in Japanese. Netsu Kaari (Heat Management: Energy and Pollution Control), 22 (7):8-15, July 30, 1970.

Tsuruo Kitani.

Identifiers: *Electric power production, *By-product recovery, *Sulfur oxides control, Japan,

Stack gases, Soot, Smokes, Pilot plants, Stacks, Scrubbers, Denulfurization of fuels, Blending, Sulfur removal (combustion products), Alkaline additives, Inorganic acids, Ammonium compounds, Sulfur compounds, Sulfates.

A report is given of how heat equipment and air pollution control equipment has been improved and how it is being managed at a thermal power plant located in Chiba Prefecture, Japan (Ichihara Works). In Chiba Prefecture, abatement regulations are applied when air quality falls below specific standards. The plant installed low-sulfur residual oil tanks in April 1966. The low-sulfur containing oil was used when the regulations are applied. In June 1966, the plant added ammonia injectors to the exhaust ducts to control air pollution and also to prevent problems associated with sulfuric acid emissions. In December 1966, the plant equipped a pilot plant for removal and recovery of sulfur dioxide. The tests and research conducted there were successful. Special attention was given to the production of ammonium sulfate by scrubbing sulfur dioxide with ammonia and the collection of the sulfate by a collecting system called 'jet-collector'. The ammonium sulfate dissolves in a solvent held by the jet collector. The ammonium-sulfate solution is then concentrated and crystallized. Over 95% recovery of sulfur dioxide is achieved; 98% recovery is possible by bringing the plant to 40-35°C. This plant is described in detail. Other equipment for air pollution control at the plant are a high central smokestack and an oil-blender, which is used to reduce the percentage of sulfur contained in the fuel oil. The plant is also directing its effort toward heat recovery, and improvements have been made at several points. The thermal efficiency of a plant power is generally 32-40% with a large percentage of heat lost in the coolant. Recovery and utilization of heat from the coolant increases heat efficiency and eliminates the public nuisance caused by discharging hot water.

APTIC-22160

CHARACTERISTICS OF SOME ROTARY IMFACTION FILTERS FOR THE REMOVAL OF 10-40 MICRON DROPLETS.

Aerosol Sci., vol. 1:147:161, 1970. 5 refs.

B. W. Soole, and H. C. W. Meyer.

Identifiers: *Droplets, *Particle size, *Centrifugal separators, Great Britain, Operating variables, Design criteria, Flow rates.

Measurements are reported of filtration efficiencies, power consumptions and pressure losses of ten rotary impaction filters operating with air flowrates of 4.72 cu m/sec. Five were designed to remove all droplets of 10, 15, 20, 30 and 40 micron (and above) respectively at 500 rpm and five all droplets of 10 micron (and above) with 14, 15, 16, 18 and 20 swg filaments respectively at 1000 rpm. Efficiencies were determined using polydisperse droplet sprays of radioactively-tagged glycerol solution at 0.033 g/cu m. Power consumptions were up to 37 per cent less than predicted because of filament self-screening. Pressure losses of 6.5-46.1 mm correlate with calculated mean velocities of air flow through the filter interstices. Filtration efficiencies at the design particle diameter deteriorate steadily with decreasing filament thickness consistent with the supposition that larger ingoing droplets are fragmented by aerodynamic shear forces as they approach the filaments. Improved efficiencies are attainable by avoiding Stokes numbers larger than the minimum necessary for complete impaction. An outline of the theory of filter design and an illustrative numerical example are given in appendices. (Author abstract modified)

APTIC-22165

CONTROLLED OPEN BURNING IN THE SAN FRANCISCO BAY AREA.

J. Air Pollution Control Assoc., 20 (8):530-533,

Aug. 1970. 3 refs.

H. C. Johnson, and H. A. James.

Identifiers: *Open burning, *Control methods, *Meteorology, Control programs, Research programs, San Francisco.

Intermingled land usage in the 3900 square mile Bay Area Air Pollution Control District presented special problems in curtailing open burning. Regulation 1, adopted in 1957, prohibited most types of open burning, with exceptions for public safety, instruction in fire fighting, flood control, agricultural burning and one- and two-family dwellings. Proposals of professional meteorologists to limit adverse effects were: to select a day of no inversion, with wind direction to carry pollutants away from local targets; and, a day of low velocity at ground level, high velocity at high altitudes. Experience has proven the need for proper stacking and drying of the wood waste to assure high temperature burning, and completion of the burn as scheduled. Even though the cost of hauling to landfills may be substantially more than the cost of burning under a variance, hauling is often selected because of the time required for stacking, drying, and waiting for designated meteorological conditions. Substantial progress has been made in curtailing agricultural burning, and burning of greenhouse waste has been stopped. Restrictions on emissions from orchard heaters has resulted in replacement with new smokeless heaters. Orchard brush can be burned only on 'burn days' designated in the winter when the inversion is predicted to be above 2500 ft. Stubble burning has continued due to the lack of a feasible alternative, and range brush burning also continues, mostly in remote areas of high elevation. Lumbering slash is burned at the insistence of forestry officials. The above burning could be limited to designated burn days, as is successfully being applied to orchard brush. Research on alternatives to agricultural burning is being spearheaded by the University of California, and its agricultural extension service. Closer cooperation by all involved in agriculture and air pollution control is necessary to develop feasible alternatives to open burning. (Author abstract)

APTIC-22340

MAINE'S NEW DUST-FREE CRUSHED STONE PLANT.

Pit Quarry, 63 (2):96-100, Aug. 1970.

Walter E. Trauffer.

Identifiers: *Mineral processing, *Control methods, *Stone, Dusts, Exhaust systems, Bag filters, Spray towers.

Most aggregate producers have, or eventually will have, problems with encroaching residential or industrial areas, tightening and changing specifications, and increasing their output. One crushed stone plant was able to solve these other problems by completely rebuilding the plant to produce more - and finer - sizes of stone, and taking drastic steps to reduce noise and blasting vibration, to control all plant and incidental dust, to shield operations from public view, and to prevent water pollution. The important environmental features and practices include complete wet and dry dust collecting systems; the dust-proofing of all haul roads (with reclaimed oil); noise shielding with acoustical treatment at the primary crusher; and the use of old conveyor belting at impact points. The combination of wet and dry dust collecting system has completely eliminated any problem with neighbors or employees. A wet system with a spray nozzle is used at the primary crusher when necessary. The dry system, which effectively controls and collects dust in the rest of the plant, comprises 456 cotton sateen tubes, with a total bag area of 6338 square feet, an intermittent shaker system, three slide discharge valves and hoppers, a size 30 AAF exhaustor, and a 75-hp motor. The dust system maintains the required suction at the eight collecting points. These are at the three cone crushers, the scalping screens, the twin sizing screens, and the shuttle and transfer conveyors. The 6000-12,000 lbs of dust collected each day are currently hauled to a pond on the plant site, but markets for it are being developed.

APTIC-22351

HYDROCRACKING AND FLUID CATALYTIC CRACKING OF GAS OILS IN TODAY'S REFINERY.

American Petroleum Inst., New York, Div. of Refining, (Proc. Am. Petrol. Inst., Sect. III, vol. 50:923-940, 1970. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 35th, Houston, Tex., May 13-15, 1970.) J. R. Murphy, M. R. Smith, and C. H. Viens. Identifiers: *Petroleum refining, *Fuel oil preparation, *Catalytic activity, Distillate oils, Gasolines, Aromatic hydrocarbons, Naphthalenes, Hydrogenation.

The capabilities and limitations of the two major gas oil cracking processes (hydrocracking and fluid cracking) are examined. The (examination is) limited to a comparison of gas oil conversion, that is, upgrading heavy distillates to gasoline and/or distillates, although hydrocracking can be operated to desulfurize with essentially no conversion, and both hydrocracking and fluid catalytic cracking with special techniques can process entire reduced crudes. The hydrocracking and catalytic cracking processes are similar only in that they reduce the molecular weight and boiling range of hydrocarbons. Hydrocracking accomplishes this with special catalysts in the presence of hydrogen which produces a highly saturated contaminant-free product. Additionally, since hydrocracking includes a severe hydrogenation step which first converts aromatics to naphthenes, it is capable of cracking highly aromatic streams such as catalytic or coker gas oils. For similar reasons and with suitable adjustment of operating variables, hydrocracking has considerable flexibility — low severity to produce mainly middle distillates and jet fuels — high severity to produce gasolines. Catalytic cracking operates at high temperature and low pressure, and produces a relatively unsaturated, aromatic product. Contaminant removal (sulfur and nitrogen) is slight. The flexibility of catalytic cracking, although considerable, is not as great as hydrocracking. Operations can be adjusted to obtain low conversions (50-60%), to produce mainly catalytic furnace oil and decanted oil. The high conversion level (80-90%) for maximum gasoline production is usually limited by the polynuclear aromatic content of feed. If contaminant removal or extremely high conversions are desirable, hydrogenation of feed stocks, products or recycle streams is necessary as an adjunct to catalytic cracking. (Author summary modified)

APTIC-22352

ENVIRONMENTAL PROTECTION-BENICIA REFINERY.

American Petroleum Inst., New York, Div. of Refining, Proc. Am. Petrol. Inst., Sect. III, vol. 50:638-650, 1970. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 35th, Houston, Tex., May 13-15, 1970.) G. E. Mitchell.

Identifiers: *Petroleum refining, *Control methods, Stack gases, Odors, Particulates, Stacks, Ringelmann chart, Centrifugal separators, Electrostatic precipitators, Vapor recovery systems, Odor counteraction, Peter spence process (claus), Design criteria, Hydrocarbons.

Protection of the environment was a basic concept in the design of the Benicia Refinery. From the inception of the project, plans were included to provide the equipment needed to maintain air, water, and noise level standards which conform with best practices. The refinery is designed to meet the stringent air and waste water quality standards prescribed by regulatory agencies in the San Francisco Bay Area. As part of the program to define the performance and equipment requirements to meet these quality commitments, an extensive survey of environmental conditions at the site was made before starting construction. The abatement systems that were installed have resulted in air and waste water qualities that have been generally satisfactory. Particulate emissions are controlled by cyclones and an electrostatic precipitator. Plume opacity does not exceed Ringelmann No. 2

for more than three minutes out of every hour. Sulfur dioxide concentrations are minimized by Claus process recovery units. Hydrocarbon emissions are restricted by vapor recovery systems. Odors originating from sulfur compounds are treated satisfactorily. Stacks are high enough to allow stack gases to disperse easily. The low refinery water usage along with the need to handle relatively large amounts of sour water has complicated the waste water treating operations. Some equipment changes are planned to improve the treating. Careful attention was given in the design and equipment procurement stages to minimizing noise levels to protect conditions in the community and also to avoid adverse effects on plant personnel. A few relatively minor deficiencies found after startup were corrected by equipment modifications. (Author abstract modified)

APTIC-22353

THE TREATMENT OF THE AIR POLLUTION PROBLEM WITHIN THE CHEMICAL INDUSTRY OF WEST GERMANY.

Pure Appl. Chem., 21 (3):403-418, 1970.

W. Teske.

Identifiers: *Abatement, *Germany, *Chemical processing, Legislation, Plant damage, Stack gases, By-product recovery, SO₂ removal (combustion products).

Legislation designed to control air pollution from the chemical industry is described. The general causes of pollution and the main pollutants are characterized. Problems of waste gas purification, incineration, and filtering are discussed. Direct methods of air pollution abatement include process modification, by-product recovery, sulfur dioxide removal, equipment changes to eliminate dusts, and purification of waste gases, including chlorine, fluorine, and organic emissions. Indirectly, emissions can be controlled with the help of special departments in the plant, by exchanging experiences with other industries, and through collaboration with the authorities. Results of research on plant damage through exposure to exhaust gases are discussed.

APTIC-22354

EFFECT OF HYDRODESULFURIZING PROCESS VARIABLES ON CORROSION RATES.

American Petroleum Inst., New York, Div. of Refining, Proc. Am. Petrol. Inst., Sect. III, vol. 50:844-877, 1970. 10 ref. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 35th, Houston, Tex., May 13-15, 1970.) J. D. McCoy, and F. B. Hamel.

Identifiers: *Corrosion, *Hydrodesulfurization, Steel, Operating variables, Hydrogen, Chromium compounds, Hydrogen sulfide, Reaction mechanisms, Pressure, Temperature.

The effect of hydrodesulfurizing process variables on high temperature corrosion rates of chromemoly and austenitic stainless steels are evaluated using gaseous mixtures of hydrogen-hydrogen sulfide. Test conditions include concentrations of 0.03 to 10.6 volume % of hydrogen sulfide; temperatures of 600 F, 750 F, and 900 F, and pressures ranging from 100 psig to 2000 psig. Corrosion rate data are obtained at intervals of 330, 830, 1600, and 2500 hours for 9 Cr, 410, 430, 304L, 321, and Incoloy 800 materials. Of the three process variables studied — hydrogen sulfide concentration, pressure, and temperature — temperature is the only variable having a significant effect on corrosion rates above 1.0 mole % H₂S. A uniform rate of corrosion does not occur until after 300 hours of exposure and the formation of a tight adhering iron-chromium sulfide film. Microprobe analyses show that the innermost layer contained an enrichment of FeCr₂S₄. From this rate data, curves are constructed which show the expected long-term corrosion rates versus temperature. From an over-all point of view, the sulfidation reaction is best represented as a fractional order rate rather than a parabolic rate. (Author abstract modified)

APTIC-22355

NEW CONCEPTS OF REFINERY WASTE TREATMENT.

American Petroleum Inst., New York, Div. of Refining, Proc. Am. Petrol. Inst., Sect. III, vol. 50:670-692, 1970. 4 refs. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 35th, Houston, Tex., May 13-15, 1970.) W. J. Grant, and R. R. Dean.

Identifiers: *Petroleum refining, Canada, Stack gases, Soot, Smokes, Stacks, Flame afterburners, Excess air, Sulfur oxides control, Design criteria, Diffusion, Nitrogen oxides.

Late this year, Gulf Oil Canada Limited will commission a new 60,000 BPD refinery at Point Tupper, in the Province of Nova Scotia. Located in an area noted for its fishing, maximum efforts were made to insure that no harmful effects would result from this new plant. A new marine terminal located in 100 feet of water will accommodate the largest ships afloat, delivering crude oil from the Middle East and Africa. About 80% of the production will be removed by ships smaller than 50,000 DWT, with deballasting rates as high as 25,000 barrels per hour. In mid-1971, a new, fully integrated, 80,000 BPD refinery will go on stream at Edmonton, in the Province of Alberta, to supply the western Canadian market. Air, water and noise pollution control requirements vary widely in these two plants because of climatic, topographical, regulatory, and operating conditions. Basic design of the anti-pollution facilities was specified by Gulf in close co-operation with the general contractors. The basic philosophy and policies are described, as well as some of the unusual design features. Stacks are high enough to allow diffusion to remove sulfur dioxide. Flares are designed to burn smokelessly. Burners with excess air capabilities are used to reduce soot and oxides of nitrogen. (Author abstract modified)

APTIC-22356

ELIMINATION OF ODORS AND DUSTS CREATED BY THE COMMUNITY AND BY INDUSTRY.

(L'eliminazione degli odori e delle polveri provocate da comunità e industrie). Text in Italian. Inquinamento, 12 (3):27-35, 1970.

J. H. Fernandes.

Identifiers: *Dusts, *Control equipment, *Odor counteraction, Odors, Kraft pulping, Incineration, Centrifugal separators, Electrostatic precipitators, Filters, Bag filters, Scrubbers, Catalytic oxidation, Pressure.

The various processes are reviewed by which odors and dust particles in the atmosphere can be reduced or eliminated. Reference is made to an extensive series of studies by the Air Preheater Company, which has developed an odor-eliminating device known as Cor-Pak, which eliminates disagreeable vapors by burning them in a flame. Odors can also be reduced by wet processes and by oxidation with a catalyst. Special attention is given to the elimination of odors from a paper mill and from incinerators where solid waste is burned. Included in the discussion of dust removal is a discussion of cyclones, scrubbers, electrostatic precipitators, and the various types of filters. Cyclones are effective with dust particles of 20 micron or larger. Electrostatic precipitators require a voltage of 50,000-100,000 V. On the other hand, the pressure drop is only about 2.5 in. cm H₂O, and the dust collecting efficiency is better than 99%. Particles of less than 1 micron are captured just about as readily as those 100 micron in size. Although bag filters are highly efficient (99.9% dust removal), the cost of installation and of replacing the bags is a serious drawback to their extensive use.

APTIC-22357

IMPACT OF GASOLINE VOLATILITY AND OLEFIN REDUCTION ON THE REFINER.

American Petroleum Inst., New York, Div. of Refining, Proc. Am. Petrol. Inst., Sect. III, vol. 50:498-513, 1970. 3 refs. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 35th, Houston, Tex., May 13-15, 1970.)
W. J. McLeod.

Identifiers: *Gasolines, *Petroleum production, *Process modification, *Volatility, Costs, Legislation, Emission standards, Smog, Fuel additives, Olefins, Tetraethyl lead, Vapor pressure.

Two studies investigating the air pollution benefits of gasoline modification and the required cost to the refiner are reviewed. Possible refinery methods for modifying gasoline are described. One method, known as front-end saturation, involves replacing the olefins with comparable paraffins. Another method involves reducing the vapor pressure (volatility) of the gas. The effects of front-end saturation on smog problems are reviewed. Unfortunately, neither the long-range nor the short-range benefits are significant. Legislation relevant to gasoline and to emission standards is reviewed. Reducing vapor pressure is more expensive and less effective than front-end saturation. It is reasonably certain that costs will be much higher in unleaded than in leaded gasoline because of the difference in effect of olefin saturation on leaded and unleaded octane ratings.
APTIC-22338

LECTURES ON PUBLIC NUISANCE. CHAPT. 1 AIR POLLUTION PREVENTION (2).

For primary bibliographic entry see Field 12.
APTIC-22406

EXHAUST HYDROCARBON COMPOSITION. ITS RELATION TO GASOLINE COMPOSITION.

For primary bibliographic entry see Field 01.
APTIC-22414

THEORY AND PRACTICE OF MODERN WET-TYPE MECHANICAL GAS CLEANING.

(Theorie und Praxis moderner massenmechanischer Gasreinigung.) Text in German. Wasser Luft Betrieb, 14 (6):233-240, June 1970. 10 refs.
Joachim H. Elischer.

Identifiers: *Dusts, *Operating variables, *Control equipment, Germany, Baffles, Filters, Venturi scrubbers.

Wet mechanical gas cleaning is accomplished by bringing about a collision of the particles carried by the gas with the washing liquid, by achieving adhesion of the particles to the drops of the washing liquid, and by separating them from the gas stream in a washing tower, a dust arrester hood, a venturi washer, or a disintegrator. The washing towers are often used not only for cleaning but also for cooling gas; they operate with small gas velocities by sprinkling the gas with water with the water having to pass through several clouds of drops and by draining the slimy wash water. The maximal dust separation efficiency is 80-90% with very high specific water consumption. As a modification, filters are sometimes inserted in these towers containing fibrous plastic or other material to achieve a more intimate contact between gas and water. Dust arrester hoods which are usually placed directly on the flue stack are inexpensive and are suited for the removal of large particles with good wettability. The cleaning effect is achieved by changing the direction of the gas flow sharply several times and by rinsing the direction changing surfaces. The venturi washer achieves an intimate contact between gas and water in a diffuser by strongly accelerating the velocity of the gas flow and thus achieving a dense fine mist. The sludge is often removed by centrifugation. These washers can be up to 99% effective, depending on the properties of the washing fluid, the gas, and the particles to be removed. A number

of modifications are described. Disintegrators are dust separators with movable parts. Rotating fan baffles bring about an intimate contact between gas and fluid which are centrally fed into the mixing chamber. Disintegrators are used for gases containing very small particles of poor wettability. The machines are spaced saving and easy to operate but have a high energy and water consumption.
APTIC-22423

ALKYLATION AND DISPROPORTIONATION OF CAT CRACKER PENTENES.

American Petroleum Inst., New York, Div. of Refining, Proc. Am. Petrol. Inst., Sect. III, vol. 50:49-62, 1970. 13 refs. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 35th, Houston, Tex., May 13-15, 1970.)
R. L. Banks, T. Hutson Jr., and R. S. Logan.
Identifiers: *Gasolines, *Fuel oil preparation, *Pentenes, Engine exhausts, Smog, Petroleum refining, Chemical reactions, Fractionation.

Studies on the effect of fuel composition on the smog forming potential of motor fuel show that the removal of C4-C5 olefins from gasoline reduces the smog forming potential of total automotive emissions by about 23%. The use of Phillips HF Alkylation and Triolefin processes to convert the pentenes in cat cracker gasoline to high quality gasoline components that make a substantially lower contribution to the smog forming potential of automotive evaporative emissions is described. In the processes, a C5 cut is fractionated from cat gasoline and processes by various combinations of HF Alkylation and Triolefin Process technology. The resulting material is blended with the C6+ gasoline fraction to yield a product gasoline containing only about 0.5% pentenes and having a greater volume and higher RON + 3 than the starting cat gasoline. In one case, a substantial yield of high-purity propylene is also obtained. (Author abstract modified)
APTIC-22433

H-OIL FOR RESIDUE ELIMINATION AND LOW SULFUR COKE PRODUCTION.

American Petroleum Inst., New York, Div. of Refining, Proc. Am. Petrol. Inst., Sect. III, vol. 50:941-972, 1970. 6 refs. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 35th, Houston, Tex., May 13-15, 1970.)
A. R. Johnson, J. E. Papso, R. F. Hippeli, and G. Nongbri.

Identifiers: *Coke, *Petroleum refining, *Hydrosulfurization, Stack gases, Oxidation.

The American refiner is faced with the problem of supplying an ever increasing requirement for light products, while at the same time reducing the yield of residual fractions. In the recent past, this has led to a considerable increase in coking capacity. At the same time in many areas there is a shift to heavier, higher sulfur crudes which aggravates the problem. One approach to solving this problem in the context of an expanding refinery is to process the coker feedstock through an H-Oil unit prior to coking. The H-Oil process is used for either desulfurization or hydrocracking of residual fractions. This achieves control of the yield to match existing coker capacity, as well as controlling the sulfur and metals content of the coke produced. In this way the refiner can achieve both increased liquid yield from the incremental residue processed, while at the same time improving the character of the coke. In other situations, where coking has not been installed and residue elimination is desired, the refiner can use high conversion H-Oil coupled with several alternates for disposing of the remaining bottoms. These are presented in some detail, including an H-Oil partial oxidation combination, and the use of H-Oil pitch as plant fuel combined with stack gas purification.
APTIC-22434

TERTIARY TREATMENT AND FLUIDIZED BED INCINERATION AT AMERICAN OIL COMPANY.

American Petroleum Inst., New York, Div. of Refining, Proc. Am. Petrol. Inst., Sect. III, vol. 50:651-669, 1970. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 35th, Houston, Tex., May 13-15, 1970.)
R. C. Mallatt, J. F. Grutach, and H. E. Simons.
Identifiers: *Incineration, *Organic wastes, *Petroleum refining, Odors, Suspended particulates, Fuel oils, Pilot plants, Exhaust systems, Filters, Electrolysis.

American Oil Company has carried out pilot plant work on two combination treatment sequences which reduce oil, BOD, suspended solids, taste and odor contributing substances, and other impurities in spent process water to levels normally associated with tertiary treatment. This has been accomplished by treating effluent from the company's patented Bio-Flotation process with alum and polyelectrolytes to coagulate the residual contaminants, followed by phase separation using either the air flotation process or mixed media filtration. Commercial facilities have been constructed at American's Whiting, Indiana, refinery and are presently being evaluated. Present plans call for disposal of sludges in a fluidized bed incinerator, based upon successful operation of a prototype unit at the company's Mandan, North Dakota, refinery. (Author abstract)
APTIC-22435

OLEFIN REDUCTION IN GASOLINES BY HYDROGENATION.

American Petroleum Institute, New York, Proc. Am. Petrol. Inst., Sect. III, vol. 50:12-48, 1970. 13 refs. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 35th, Houston, Tex., May 13, 1970.)
J. C. Barbier, J. Cosyns, M. Derrien, and J. F. Le Page.

Identifiers: *Olefins, *Hydrogenation, *Gasolines, Eye irritation, France, Fuel evaporation, Smog, Operating variables, Tetraethyl lead, Catalytic activity, Chemical reactions, Photochemical reactions.

A review of the effects that are caused by the presence of olefinic compounds in fuels, and of methods to reduce the olefin content of gasoline is presented. When olefins are emitted into the atmosphere by losses through evaporation during storage, transfer, or use, they are more susceptible than other families of molecules to photochemical transformations in the atmosphere, which lead to smog, eye irritation, and other phenomena. To reach a required octane rating, adding olefins serves to reduce the lead content and in this way to decrease the risks of lead pollution. Various methods to reduce the olefin content of gasoline are discussed, particularly hydrogenation. The chemical reactions, catalysts, and operating conditions of each method are presented.
APTIC-22436

CENTRALIZED DESULFURIZATION AND TROPICAL AGRICULTURE: EFFECTIVE USE OF ASPHALT.

(Shuchu datsuryu to nettai nogyo - asufaruto no yuko riyu). Text in Japanese. Sekiyu Gakkai Shi (J. Japan Petroleum Institute, Tokyo), 13 (8):654-656, Aug. 25, 1970. 1 ref.

Personal Author Not Recorded.

Identifiers: *Asphalt, *By-product recovery, *Desulfurization of fuels, Japan, Farms, Alcohols, Ammonia, Hydrazines.

Various ways of utilizing asphalt produced in the process of desulfurizing petroleum are presented. In the Middle East countries, India, and Pakistan, deserts were turned into farm lands but they are now suffering from salination. If an asphalt layer of 1/8 in. thickness can be formed 2-3 feet below the surface, the salination can be prevented. Japan is now utilizing only 3,000,000-4,000,000 kl/yr of

asphalt made from the crude oil imported from the Middle East, and is burning all the rest with crude oil to cause air pollution. Crude oil from the Middle East contains 15-25% asphalt, which amounts to 30,000,000 kg/yr of asphalt to Japan. If one third of the asphalt is used to form the layer to prevent salination, 700,000 hectares of farm land can be obtained. Another one third can be used to produce 9,000,000 tons of ammonia. The rest can be used to produce 13,000,000 tons of methanol. Such a project will change the poor Middle Eastern countries into rich agricultural countries. The project would be similar to the TVA project in U. S. The Middle Eastern countries, especially Saudi Arabia and Pakistan, are very much interested in the project.
APTIC-22437

GA-OIL ULTRACRACKING.

American Petroleum Inst., New York, Div. of Refining, Proc. Am. Petrol. Inst., Sect. III, vol. 50:63-73, 1970. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 35th, Houston, Tex., May 13-15, 1970.) C. G. Frye, D. L. Muffat, and H. W. McAninch. Identifiers: *Naphthalenes, *Ultracacking, *Fuel oils, Gasolines, Petroleum refining, Fuel oil preparation, Aromatic hydrocarbons, Catalytic activity.

Ultracacking is a new process developed to convert gas-oils to naphtha. The product is particularly well suited for reforming both to high-octane naphtha for unleaded gasoline and to aromatics for petrochemicals. Feed for the Ultracacker installed at Texas City is a combination of virgin and cycle stocks; the fresh feed rate is about 40,000 B/SD. Volumetric yield is 120-125% naphtha (C4+), depending upon the composition of the feed. The process uses an extremely stable new catalyst. The Ultracacker was brought on-stream with little difficulty, and has since operated with only minor interruptions. The entire system is under digital control with analog and manual backup. In contrast to other hydrocracking systems, it uses 100% reformer hydrogen and a turbine-driven centrifugal compression system. The design of the reaction section is based upon data from a 5-bed adiabatic pilot plant with a normal feed rate of about one-half barrel per day. (Author abstract modified)
APTIC-22438

ADSORPTION AS A TREATMENT OF REFINERY EFFLUENT.

American Petroleum Inst., New York, Div. of Refining, Proc. Am. Petrol. Inst. III, vol. 50:693-722, 1970. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 35th, Houston, Tex., May 13-15, 1970.) E. G. Paulson. Identifiers: *Petroleum refining, *Organic wastes, *Adsorption, Costs, Carbon black, Odors, Suspended particulates, Fuel oils, Odor counteraction.

An investigation to determine the technical and economical feasibility of treating refinery effluents by means of the granular activated carbon waste treatment is presented. Data show that granular activated carbon treatment can produce a refinery effluent containing less than 20 mg/l BOD and less than 10 units of Recognition Odor Number (RON) from either primary or secondary refinery effluents. Evidence that those organic compounds contributing to odor are preferentially adsorbed relative to total mixture of organic contaminants is also shown. In addition, necessary pretreatment requirements to effect suspended solids reduction below 60 mg/l and oil less than 20 mg/l prior to carbon treatment are described. Capital cost estimates for 1, 5 and 10 MGD plants are given. Boreakdowns include estimates for clarification and adsorption/reactivation systems. (Author abstract modified)
APTIC-22518

DUST CONTROL OF REVERBERATORY AND BLAST FURNACES FOR BATTERY SCRAP.

(Nanariyokai seiren saiseiro no haigaku shuin no jishu rei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6 (8):645-648, Aug. 1970.

Akira Hama.

Identifiers: *Lead, *Furnaces, *Bag filters, Japan, Dusts, Smokes, Blast furnaces, Primary metallurgical processing, Operating variables, Venturi scrubbers, Design criteria, Safety equipment, Sulfur dioxide, Sulfur trioxide, Flow rates, Pressure, Temperature.

The flue gas from a lead refinery contains 50-70% lead in the dust, and its high density makes the rising and dispersion of the gas difficult. The operation of the furnace without the use of a dust collector is almost impossible. Low-cost, wet type dust collectors used to be employed for lead reverberatory furnaces, but because of the difficulty due to high SO₂ and SO₃ contents in their maintenance, efficiency, waste-water control, and dust collection a dry-type apparatus was developed employing a bag filter. The design and operation of the dust collector are described. An inverted U-shaped, venturi type spray system is employed to cool the gas to 80-90 °C. The main feature of the present device is the vibro-clean bag filter. The dust accumulated on the cloth felt filter is shaken off by a one-half second blast of air, at a pressure of 400-500 mm Hg, vibrating at a frequency of 1000 Hz. The felt filter is operated at the flow speed of 1.0-1.5 cu m/min, and the pressure loss of 150-200 mm Hg. The filter is renewed after a period of 10-15 months. A safety device for the abnormal temperature rise of the filter and its maintenance is described. The development of an inexpensive anti-corrosive liner material and an SO₂-removal device are some tasks left for the future.
APTIC-22520

NOW-RECOVERY BOILERS CONTROL ODOURS.

Mod. Power Eng., 64 (7): 50-53, July 1970.

Personal Author Not Recorded.

Identifiers: *Kraft pulping, *Odor counteraction, *Design criteria, Canada, Stack gases, Odors, Boilers, Evaporators, Electrostatic precipitators, Process modification, Firing methods, Sulfur dioxide, Hydrogen sulfide.

A recovery boiler which controls the odors emitted by a kraft pulping plant is described. The new type of unit features a design eliminating any contact between odor bearing black liquor and cool stack gases, preventing the escape of odors to the atmosphere and minimizing the odor problems associated with conventional black liquor chemical and heat recovery boilers. The new boiler design uses multiple-effect evaporators to concentrate the liquor to 65% solids, suitable for direct firing in the boiler. Heat recovered by the direct-contact evaporator in conventional designs is recovered by an enlarged economizer section. The new units use a wall spraying technique of liquor firing to provide stable furnace combustion over a wide range of liquor concentrations. Liquor drying is achieved by secondary air. Air admitted to the hearth burns liquor char, reduces sulfates to sulfides, and smelts chemicals for recovery. Gases discharged from the unit can be controlled to less than 1 ppm hydrogen sulfide. Elimination of the direct-contact evaporator causes changes in the electrostatic precipitator design. The precipitator must have an increased efficiency to maintain the weight of sodium sulfate fume passing up the stack at the same level that could be achieved with conventional designs. The units will discharge more sulfur dioxide to the atmosphere, but it is expected to be below 500 ppm.
APTIC-22522

MEASURES DESIGNED TO REMOVE ODOR GENERATED BY A COCOA PROCESSING PLANT.

(Massnahmen zur Beseitigung von durch Kakaowerke bedingten Geruchsbelästigungen). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 33:57-60, 1970.

Arnold Heller.

Identifiers: *Cocoa processing, *Odor counteraction, Germany, Stack gases, Odors, Food and feed operations, Flame afterburners, Absorption, Oxidation.

The roasting of cocoa beans at 130 °C generates a characteristic sweet pungent roasting odor, the processing of the roasted beans liberates tannic acid, and finally cocoa butter emits a not unpleasant but in the long run offensive odor. To neutralize the roasting gas, a smoke burner m. of chrome-nickel steel alloy was developed using city gas which in a combustion chamber at 1000 °C oxidizes quantitatively all odorous substances. The discharge temperature of the purified gases is 450 °C. To neutralize the residual odor still emanating from the work rooms of the plant, the air was channeled with the help of powerful ventilators by means of air ducts into a second smoke burner where combustion of the odor-laden air took place and eliminated what odor was still emanating from the plant after the roasting odor was neutralized. Newly designed equipment for chocolate and related factories is now being built (vacuum containers with agitators and vacuum pump heated by a steam jacket) which eliminate the emission of odors by plants using such equipment. The vacuum pump draws off the odor containing air which is absorbed by the cooling water and discharged into the drainage system.
APTIC-22525

EFFECTS AND COUNTERMEASURES OF AIR POLLUTION INDUSTRIAL PRODUCTS AND MEDICINE.

(Kogyo seihin igaku ni okeru taiki oken no eikyo to sono taisaku). Text in Japanese. Kukichowa to Reito (Air Conditioning Refrig.), 10 (2):33-40, Jan. 15, 1970. 5 refs.

Kosuke Hirasawa.

Identifiers: *Materials deterioration, *Bacteria, *Particulates, *Control equipment, Economic losses, Standards, Japan, Food and feed operations, Particle size, Air conditioning equipment, Fans (blowers), Filters.

Air pollutants that affect industrial production are discussed. They are mainly large particulates such as dusts and bacteria. Various purity indexes and maximum allowable particle sizes are tabulated for precision industries such as semiconductor, watches, optical equipments, and computers as well as for medical and food production requirements. Contamination by bacteria is a serious problem, especially in food production. Some quality control data are presented diagrammatically for various precision industries. They are plotted against the air purity index. Different standards for air purity and methods of measuring the concentration of particulates and bacteria and their sizes are introduced. In addition various air cleaning devices are presented. For example, conventional, cross-flow and down-flow type air cleaners, air showers, hand showers, gelatin mattresses and vacuum cleaners are some of them. Suggestions are given as to the advantages and disadvantages of each device.
APTIC-22530

BEHAVIOR OF SULFUR AS AIR POLLUTION SOURCE.

(Taiki osengen toshiten to no kyodo ni tsuite).

Text in Japanese. Nenryo oyobi Nenshyo (Fuel and Combustion), 37 (4):313-321, April 1, 1970.

Shoji Watanabe.

Identifiers: *Sulfur oxides, *Residual oils, *Desulfurization of fuels, *SO₂ removal (combustion products), Costs, Japan, Combustion products, Particulates, Sulfur dioxide, Sulfides, Catalysts.

Direct and indirect desulfurization of heavy oil are the primary measures of sulfur elimination, but their problem is the high costs of constructing plants and operation. The consumption of heavy oil is supported by its inexpensiveness. Disposing of the resulting sulfur (800 thousand tons percent of desulfurization a year) and the rise of heavy oil

viscosity with the decrease of sulfur content are also problems. Economical purification of exhaust fume is yet to be completed because of the difficulties encountered in processing large volumes of exhaust gas. Action carbon and active manganese oxide methods are now being examined. Wet purification seems not to be applicable in Japan. Production of polysulfides of oxygen instead of sulfur dioxide or sulfur trioxide from heavy oil combustion was studied, and the polysulfides were considered to be not actively poisonous. The reaction was carried out with additives in heavy oil and the process was named the combustion catalyst method. Results: 1) the decrease in smoke particle counts, even very fine ones which cannot be gathered by a filter, 2) the reduction of 50% of exhaust sulfur dioxide and the prevention of boiler corrosion by reduction of sulfur trioxide, 3) an increase in combustion efficiency and a decrease in the operating cost, 4) the possibility of immediate application because large plants are not necessary, and 5) economical accomplishment of pollution control by not requiring high investment costs, maintenance costs, etc. In addition to these advantages, the rise in the cost of 30% desulfurization is estimated to be 130 yen per kilo liter of heavy oil and it is the least expensive. APTIC-22536

OFFENSIVE ODOR REMOVAL BY COMBUSTION AND THE DEVELOPMENT OF THE APPARATUS.

(Nenasho ni yoru akuu jykoku sochi. Nenasho dasu sochi no kaitasu). Text in Japanese. Akashi no Kenkyu (J. of Odor Control), 1 (2):43-50, June 20, 1970. Kazumasa Kikuchi. Identifiers: *Odors, *Sewage treatment, *Odor counteraction, Japan, Bacteria, Field tests, Combustion, Temperature, Infrared radiation.

An invention for deodorizing an ill-smelling waste gas is reported. The device operates by burning the gas at high temperature to convert ill-smelling particles into ultra-fine particles, which are subsequently subjected to thermal decomposition. The combustion chamber consists of two concentric cylinders. The ill-smelling gas is first introduced to the space between the two cylinders and flows down along the inner cylinder before entering the inner cylinder. As it flows along the inner cylinder the gas is rapidly heated up and becomes ultra-fine particles, since the inner cylinder is heated at 1400-1600 C by a burner. Infra-red light is also employed to decompose the ill-smelling elements by oxidation. High-pressure hot air jets are emitted from around the burner frame to obtain the maximum heat from the crude oil combustion. High temperature exhaust gas from the device is efficiently utilized to reduce the running cost. Odor removal of 90-95% is achieved. The whole system can be made portable to be used for an excreta-collection vehicle. Propane gas is used as fuel. A test showed an odor-removal rate of 95-99%. Test procedures for odor, bacteria, ammonia, hydrogen sulfide, and sulfur dioxide are described in detail. APTIC-22538

PRODUCTION OF LOW-SULFUR COKE.

Coke Gas (English translation from Russian of: Koksi i Khim.), vol. 12:12-14, 1969, 6 refs. O. F. Federov, V. Yu. Uaitlov, R. E. Leibovich, A. I. Bublik, and V. F. Shelnov. Identifiers: *Coke, *Coal preparation, Ussr, Particle size, Pyrolysis, Temperature.

High-temperature laboratory ovens were constructed to study the high-temperature carbonization of individual coals and blends. The ovens are heated from one side by burning mixtures of natural gas and cold air in slotted burners which serve to direct the heat flow and thus insure rapid heating in the charge. The heated oven walls consist of carborundum slabs 35 mm thick. Tests of the individual coals and blends showed that high-temperature carbonization (axial temperature 1425 C)

produces coke which retains 64.4-72.9% of the original sulfur in the charge compared with 70.7-90.0% after conventional carbonization. Thus a large proportion of the sulfur is converted to gaseous carbonization products. Compared with conventional metallurgical coke, the high-temperature variety contains a more branching network of fissures. After a shatter test. The residue was completely devoid of lumps exceeding 80 mm. The yield of the 40-25 mm size fraction varies between 26.2 and 48.6%. That of the below 25-mm size fraction is 19.7 to 20.2%. APTIC-22545

ANALYTICAL METHODS FOR DETERMINATION OF AEROSOLS BY MEANS OF MEMBRANE ULTRAFILTERS. XV. HYDRODYNAMICAL PROPERTIES OF MEMBRANE AND NUCLEAR PORE FILTERS.

Collection Czech. Chem. Commun. (Prague), 35 (7):2087-2099, 1970, 19 refs. J. Machacova, J. Hrbek, V. Hampl, and K. Spury. Identifiers: *Nuclear pore filters, *Membrane filters, *Flow rates, Czechoslovakia, Aerosols, Pressure.

The properties of membrane and nuclear pore filters are assessed while following the gas flow through their porous structure. The limits to the applicability of equations for pressure drop and for the determination of mean pore radius are described. The equations for determination of gas flow through a capillary are modified for use with pore filters, and their applicability is determined experimentally with real membrane and nuclear ultrafilters. The agreement of theory with experiment is qualitatively very good and with some types of pore filters the agreement obtained is nearly quantitative. It is experimentally found that the best results for the determination of the mean filter pore size are obtained with the equation for the molecular type of flow. (Author abstract modified) APTIC-22549

CHANGING PRACTICES IN AGRICULTURE AND THEIR EFFECT ON THE ENVIRONMENT.

For primary bibliographic entry see Field 01. APTIC-22550

EFFECTS OF TOLUENE CONTENT IN FUEL ON AROMATIC EMISSIONS IN THE EXHAUST.

J. Air Pollution Control Assoc., 20 (9):609-611, Sept. 1970, 9 refs. J. S. Ninomiya, and B. Biggers. Identifiers: *Aromatic hydrocarbons, *Toluenes, *Engine exhausts, Gasolines, Aldehydes, Heptanes, Octanes, Benzenes, Styrenes.

Investigations were conducted to determine the effects of toluene levels in fuels on aromatic hydrocarbon and benzaldehyde emissions. The fuel blends used contained 20, 40, 60, and 80 weight percent toluene, the balance consisting of isooctane and n-heptane. Each blend had a research octane number of 100. To compare emissions on equal basis, the exhaust products were expressed in moles emitted per one mole of toluene burned. The fractional mole concentrations of benzene and benzaldehyde did not change with variations in the toluene content of fuel, but those of ethylbenzene and styrene increased with decreased toluene content. The fractional mole concentration of unburned toluene in the exhaust decreased with an increase of the paraffin content of the blends. This suggests that an increase in the alkyl radical concentration enhances the decomposition of toluene. On the other hand, such effects will probably diminish at a higher equivalence ratio because the concentrations of alkyls is likely to be reduced by oxygen. APTIC-22627

NEW PROCESSES MAY HELP CLEAN UP AIR POLLUTION.

Australian Engr., (Sydney), 1970:29-31, July 1970. Personal Author Not Recorded. Identifiers: *Fly ash, *By-product recovery, *Catalytic oxidation, *SO₂ removal (combustion products), Australia, Stack gases, Contact processing, Electrostatic precipitators, Packed towers, Sulfuric acid, Sulfur trioxide, Heat transfer, Temperature.

The catalytic oxidation (Cat-Ox) system described is said to remove at least 90% of the sulfur dioxide in flue gas and virtually all of the fly ash. The system converts the sulfur dioxide into sulfuric acid which can be sold commercially to recover some of the costs of the system. Two versions of the Cat-Ox process are available: a fully integrated scheme where the system is designed from the beginning to be an integral part of the total plant and a reheat scheme which is an independent system that can be fitted into existing plants. In the integrated system, flue gases are first purified by passage through an electrostatic precipitator. The gases next pass to a converter where sulfur dioxide is oxidized to sulfur trioxide in the presence of a vanadium pentoxide catalyst, the sulfur trioxide reacting with water vapor in the flue gas to form sulfuric acid vapor. The gas stream containing the sulfuric acid vapor is cooled to just above dew point in an economizer and air heater. The cooled gas is then brought into direct contact with a stream of cooled sulfuric acid in a packed-bed absorption tower. This serves to reduce the temperature of the gases to 225-250 F and thus condense the sulfuric acid vapor. Any sulfuric acid remaining in the form of mist is treated in a Birk mist eliminator. In existing plants, flue gas is diverted to the Cat-Ox system just before it enters the stack and while it is relatively cool. To bring the gases to the required temperatures, the reheat scheme provides for heat exchange between the gases to be treated and exit gases from the converter and also for direct injection of hot gas into the flue gases. Treatment of the reheated gas then proceeds as with the integrated system. The Cat-Ox process should reduce air pollution by power plants, smelters, oil refineries, and petrochemical plants. APTIC-22631

SULFUR RECOVERY IN THE MANUFACTURE OF PIPELINE GAS FROM COAL.

Ind. Eng. Chem. Prod. Res. Develop., 9 (3):362-368, Sept. 1970, 18 refs. (Presented at the American Chemical Society, Div. of Fuel Chemistry Symposium on Chemicals from Coal, New York, N. Y., Sept. 1969.) C. L. Rasor, J. L. Arora, and W. W. Bodie. Identifiers: *Coal, *Fuel gases, *Costs, *Sulfur compounds, By-product recovery, Gasification (synthesis).

Sulfur consumption in the U. S. is projected to reach 11,000,000 and 17,000,000 long tons by 1970 and 1975, respectively. A large part of this increase may be met by desulfurization of fuels, in particular by the recovery of sulfur during the conversion of coal to pipeline gas by hydrogenation. In the manufacture of pipeline gas from 1.5 and 4.5% sulfur coals, 15-25% of the sulfur is oxidized to sulfur dioxide during pretreatment; the remainder is converted to hydrogen sulfide during gasification. Sulfur recovery from the H₂S by the Claus process ranges from 90 to 370 long tons per day for 1.5 and 4.4% sulfur. Recovery costs vary from \$23.6 to \$5.3 per ton as a break even cost varying inversely with the sulfur content. Because of the higher unit cost of recovery and the small amount of sulfur obtained from low-sulfur coal, the effect of recovery on gas prices is slight: one cent or less per million Btu. With high-sulfur coals, the effect is more pronounced, ranging from just under two to over 5.5 cents as the sulfur prices increase from \$20 to \$40 per ton. Recovery of sulfur from both H₂S and SO₂ from high-sulfur oven has the advantage that enough sulfur is recovered to pay for the costs of extracting it from SO₂ and removing it as CaSO₄. This applies even when the price of sulfur is \$20 per ton. The combined

removal would reduce gas prices by several cents per million Btu.
APTIC-22632

HYDRODESULFURIZATION OF BITUMINOUS COAL CHAR.

Ind. Eng. Chem. Prod. Res. Develop., 9 (3):357-361, Sept. 1970. 5 refs. (Presented at the American Chemical Society, Div. of Fuel Chemistry Symposium on Chemicals from Coal, New York, N. Y., Sept. 1969.)

Charles A. Gray, Martin E. Sacks, and R. Tracy Eddinger.
Identifiers: *Reaction kinetics, *Feasibility studies, *Coal chars, *Hydrodesulfurization, Coal, Particle size, Desulfurization of fuels, Diffusion, Iron compounds, Hydrogen sulfide, Pyrolysis.

As experimentally determined, there appears to be no feasible way of completely hydrodesulfurizing Illinois No. 6 char, produced by the multistage pyrolysis of coal. Although saturation of the sulfur-carrying capacity of the gas phase during hydrodesulfurization at 1600 F was rapid, the presence of hydrogen sulfide in the gas severely retarded the desulfurization. Even after prolonged hydrotreatment, about 10% of the initial sulfur remained in the char. The reaction of the ferrous sulfide in the char with hydrogen proceeded more slowly than was expected. The rate-limiting step of the hydrodesulfurization process appears to be either the inherent solid-gas kinetics or the diffusion of hydrogen sulfide through the reaction shell of iron surrounding a core of still unreacted ferrous sulfide. If the latter hypothesis is correct, the rate of removal of 'pyritic' sulfur in hydrogen atmospheres should vary with the inverse square of the diameter of the initial pyrite particles. Because of the high equilibrium ratio of hydrogen to hydrogen sulfide, an acceptor material would have to be mixed with the char to have a commercially viable process.
APTIC-22633

POTASSIUM FORMATE PROCESS FOR REMOVING SO₂ FROM STACK GAS.

Environ. Sci. Technol., 4 (9):757-765, Sept. 1970. 8 refs. (Presented at the American Chemical Society, Div. of Water, Air, and Waste Chemistry, Meeting, 159th, Houston, Tex., Feb. 1970.)

Paul M. Yavorsky, Nestor J. Mazzocco, Gerald D. Rutledge, and Everett Gorin.
Identifiers: *By-product recovery, *Adsorption (general), Stack gases, Scrubbers, Formic acid, Potassium compounds, Sulfur compounds, Pressure, Temperature.

A new process for removing sulfur dioxide from stack gas encompasses absorbent regeneration and sulfur recovery. In stack gas scrubbing, sulfur dioxide is adsorbed by a concentrated potassium formate solution at 200 F, producing thiosulfate. The spent scrubber solution is transferred to a regeneration unit where the thiosulfate is reacted with additional formate at 540 F to produce hydrosulfide. The potassium hydrosulfide is stripped with carbon dioxide and steam to release hydrogen sulfide from which elemental sulfur is recovered in a Claus reactor. After stripping, the remaining solution of potassium carbonate and bicarbonate is regenerated to potassium formate by reduction with carbon monoxide at 1000 psia and 540 F. The formate solution is then recycled to the scrubber. Advantages of the method include an all-liquid recycle system, no gas reheat, and mild conditions for regeneration and sulfur recovery. (Author abstract modified)
APTIC-22641

INCINERATOR EMISSION CONTROL.

Ind. Water Eng., 7 (8):26-31, Aug. 1970.
Walter R. Nissenes, and Adel F. Sarofim.

Identifiers: *Design criteria, *Incinerators, *Control methods, Combustion gases, Particulates, Soot, Fly ash, Fumes, Smokes, Flame afterburners, Scrubbers, Overfire air, Underfire air,

Hydrochloric acid, Hydrocarbons, Carbon monoxide, Pyrolysis, Combustion, Gases, Temperature.

Methods of controlling both particulate and gaseous incinerator emissions are reviewed. Particulate emissions are best controlled by improvement of the combustion process itself, especially elimination of underfire air. Entrainment of mineral particulate (the incombustible fraction of fly ash), however, will not be completely eliminated by this procedure since the buoyancy of the combustion gases will induce an air flow producing a minimum particulate emission. Entrainment of particulate by buoyancy-driven flows will, therefore, increase with furnace size and flame temperature. Of the three types of combustible particulates, char is entrained at low velocities in amounts depending on the make-up and degree of agitation in the refuse bed. Soot formation may be prevented by proper design and placement of overfire air or stream jets. Smoke produced by unreacted hydrocarbons can be eliminated by afterburning or the adjustment of air flow to a furnace to provide better overhead mixing. Control of gaseous combustible pollutants, hydrocarbons and carbon monoxide, is contingent on proper mixing between partially-burned products of pyrolysis and air and fuel in an afterburner. Because of projected increases in hydrogen chloride emissions, consideration should be given to countercurrent flow, multiple tray plate-type scrubbers for the recovery of noncombustible gaseous pollutants.
APTIC-22642

MHD: THE POWER GENERATION PROGRAM FOR ENVIRONMENTAL CONTROL.

Natl. Eng., 74 (8):8-10, Aug. 1970.
Personal Author Not Recorded.

Identifiers: *Magnetohydrodynamics (mhd), Costs, Particulates, Control methods, Nitrogen oxides, Sulfur oxides, Temperature.

A group of New England utilities have undertaken the design phase of a 50,000 kilowatt magnetohydrodynamic power generation which promises enormous advantages of air and water pollution control and which, eventually, is expected to eliminate the need for the steam turbine cycle. In a MHD generator an electrically conducting hot gas replaces the copper conductors of present-day power plants; thus, temperatures of 5000 F are typical of MHD operations compared to peak working temperatures to around 1000 F in present systems. Because of their higher efficiencies, the total amount of waste heat rejected by developed base-load MHD power plants will be less than half that rejected by conventional power plants of comparable capacity, and less than one-third that rejected by present-day nuclear power plants. MHD power plants can also be designed to operate without cooling water, and thus can eliminate thermal pollution of water. A reduction in electricity costs of up to more than 1 mill per kilowatt hr can be expected. Emissions of particulate matter, sulfur oxides, and nitrogen oxides are presented tabularly for conventional steam and MHD power production. A breakdown of production costs is also presented.
APTIC-22649

DUCTWORK ARRANGEMENT CRITERIA FOR ELECTROSTATIC PRECIPITATORS WITHOUT MODEL STUDY.

J. Air Pollution Control Assoc., 20 (9):577-581, Sept. 1970.

J. K. Zarfos.

Identifiers: *Exhaust systems, *Design criteria, *Ductwork.

Good gas distribution in industrial gas cleaning installations is achieved by designing the transport system to be compatible with two basic devices used for flow control; these are turning vanes, flat or curved, and diffuser elements such as grids and perforated plates. If no corrective devices are used in duct changes of direction, large eddies or swirls

are established, which frequently cause reverse gas flow along the inside surface of the duct. Vanes do not correct flow but merely transfer it, picking off equal volumes of gas and projecting them toward equal areas of down stream duct. Diffuser elements are used to: create a resistance and cause the gas to fill the duct; absorb energy from a fast moving gas stream entering a large chamber, thereby preventing the formation of swirls; break up large swirls into many small ones. Duct configuration is also discussed. Mitered 90 deg turns are preferred to large radii turns because they are less costly to fabricate and typically have more vanes. Inside duct surfaces should be as free as possible of projections, dimples, and changes in cross section.
APTIC-22653

RECOVER CHEMICALS FROM SODIUM-BASE SULFITE PULPING.

Chem. Eng., 77 (20):138-140, Sept. 21, 1970.

H. Romantschuk, and T. Vuojolainen.

Identifiers: *Paper manufacturing, *By-product recovery, Europe, Sodium carbonate, Sulfur dioxide, Hydrogen sulfide.

A commercially proven process to remove sodium and sulfur from sodium-base sulfite pulping operations is described. The process is analogous to closed chemical circulation cycles found in kraft pulp mills, with a number of exceptions. The recovered products are in the form of hydrogen sulfide (and later sulfur dioxide) and sodium carbonate. The process accepts all spent liquors, regardless of their proportions. Operations and control of the process are simple. Capital costs of the system are comparable with other plants, and operating costs are low compared with the value of the recovered products. The plant recovers 20 tons/day of SO₂ and 22 tons/day of pure sodium carbonate.
APTIC-22655

ISOTOPE EXCHANGE IN CARBON MONOXIDE MOLECULES OVER ZINC AND FERRIC OXIDES.

For primary bibliographic entry see Field 06.

APTIC-22658

IMPROVEMENTS IN OR RELATING TO PROCESSES FOR THE RECOVERY OF SULPHUR FROM SULPHIDE ORES.

(Assignee Not Given.) Brit. Pat. 417,276. Sp., Oct. 2, 1934. (Appl. June 21, 1933, 8 claims.)

Sibley Byron McChuskey.

Identifiers: *SO₂ removal (combustion products), *Reduction, United states, Furnaces, Primary metallurgical processing, SO₂ removal (combustion products), Absorption (general), Sulfides, Oxidation, Condensation, Flow rates, Water.

A cyclic process for the recovery of elemental sulfur from sulfide ores is described. The ore is subjected to an oxidizing roast, while the sulfur dioxide concentration in the gases so obtained is controlled by introducing a mixture of air and a predetermined proportion of SO₂ into the furnace. Gases from the furnace are passed to a conversion chamber, supplied with a carbonaceous fuel, where the reduction of a portion of the SO₂ to sulfur occurs. Elemental sulfur is removed from the gases leaving the conversion chamber by condensation. The gases are then treated to recover the remaining SO₂, which is effected by absorbing the SO₂ from the gases with water and then expelling the dissolved SO₂ from the solution by intimate contact with air. This SO₂-air mixture is then passed to the roasting furnace. The flow rate of the SO₂-containing gas into the conversion chamber is regulated so as to avoid uneconomic fuel consumption and to obtain only a partial reduction of the SO₂. Gases supplied to the conversion chamber contain about 11-12% SO₂ and 6.7-5.4% oxygen.
APTIC-22658

UNDERGROUND RESERVOIRS IN FRANCE.

Gas World, vol. 162:292-296, Sept. 11, 1965. 6 refs.
M. Swias.
Identifiers: *Storage facilities, *Natural gas,
*Compressed gases, France, Soils, Operating variables.

Gas pipelines to Paris run through areas which contain geologic formations sufficiently porous and permeable to permit the storage of liquefied natural gas. One typical reservoir, at Lussagnet, is at the peak of an anticline with a 500-meter thick layer of marl above it. There is also a limestone layer in contact with the reservoir, which is a 40-50 meter thick layer of sand of high permeability and good porosity, intersected by a fault which forms a permeable barrier. Consequently, most of the wells, which number over 30, reach the main part of the sand layers. Gas on its way to the surface penetrates a sand filter, passes down to the bottom of a well, then up along a two-inch wide tube before entering the tube leading to the surface. Maximum permitted pressure is a function of the weight of cap rock and the possibilities of gas movement through it. Considerations of water-gas interface movement govern withdrawal rate, the maximum of which is 5 million cu m day. Maximum capacity of the tank is about 700 million cu m. Similar reservoirs exist at Beynes and St. Ilers. At the Beynes facility, telecontrolled valves are installed on each well head. Controls are located at the station which houses the compressors and purifying equipment. The purifying equipment removes cyanide and similar compounds, sulfides, aromatics, phenols, and polymerizable hydrocarbons to preserve the purity of potable water.
APTIC-22690

STUDY ON THE UTILIZATION OF PYRRHOTITE PRINCIPALLY COMPOSED OF IRON AND SULFUR. III. ON SULFUR MAKING BY THE CATALYTIC REDUCTION OF ROASTING GASES WITH BLAST FURNACE GASES.

Sci. Rep. Tohoku Univ., Ser. 3, vol. 3A:397-406, 1951. 1 ref. PART IV. ON THE DIRECT REDUCTION OF ROASTING GASES WITH COKE. Ibid., vol. 3A: 407-412, 3 refs. (Presented at the Japan Society of Metals General Meeting, 14th, Hiroshima, Japan, Oct. 1943.)
Torajiro Ishiware, Kichizo Niwa, and Toshio Ito.
Identifiers: *Stack gases, *SO₂ removal (combustion products), *Catalysts, *Reduction, Japan, Coke, Blast furnaces, By-product recovery, Iron compounds, Nitrogen, Carbon monoxide, Oxygen, Sulfur compounds, Flow rates, Gases, Temperature.

Studies on the catalytic reduction of roasting gases with blast furnace gases in order to make sulfur from them are reported. Sulfur dioxide is catalytically reduced with pure carbon monoxide, using three kinds of catalysts, and the following conditions are studied with the intention of obtaining the greatest yields of sulfur: the kind of catalyst, temperature of catalyst, decrease of catalyst efficiency due to continuous use, and the relation between weight of catalyst and gas flow. From a practical standpoint, the use of blast furnace gases instead of pure CO yields comparatively better results by preventing the decrease of catalyst efficiency because of dilution of gas with nitrogen. By using roasting gases (from which oxygen is removed) in place of pure SO₂, still better results are obtained. Using a roasting gas with an equal SO₂/O₂ ratio, the relations between the resulting yields of sulfurs and the reaction temperatures are found. (Author abstract modified)
APTIC-22692

SOME CHARACTERISTICS OF STABILIZED SMOKE FLAMES.

Combust. Flame, 15 (1):93-96, Aug. 1970. 4 refs.
B. K. Biswas, and R. H. Essenhigh.
Identifiers: *Smokes, *Incineration, *Secondary air, Air-fuel ratio, Design criteria.

Experiments are being carried out to provide more details on the flames produced when an aerodynamic flameholder is utilized to reduce incinerator smoke. Four types of flame are illustrated, the prime variable leading to the changes being an increase in the air/fuel ratio. When the incinerator is hot there should be little risk of smoke emission so long as overbed mixing is reasonably good, but when the walls are cold, which occurs periodically with intermittently operated units in apartment blocks, the smoke will not burn unless there is a flameholder. Smoke is experimentally generated at the bottom of a vertical steel pipe, 3 in. in diameter and about 3 ft long, by incomplete combustion of chad from computer cards. Injection of secondary air through eight ports near the top of the pipe is designed to produce two vortex flows rotating in opposite senses. The eight injection ports are split in two sets and the shear between the two flows generates intense turbulence with substantial backmixing. As illustrated by the photographs, this method of stirring produces a clean-burning smoke flame with fairly clearly defined inner and outer cones. Chemical composition of the smoke is also mentioned.
APTIC-22821

OVERFIRE AIR JETS FOR INCINERATOR SMOKE CONTROL.

Combustion, 42 (2):20-22, Aug. 1970. 3 refs.
(Presented at the Air Pollution Control Association, Annual Meeting, 62nd, New York, June 26, 1969, Paper 69-225.)
Elmer R. Kaiser, and Joseph B. McCaffery.
Identifiers: *Smokes, *Incineration, *Overfire air, Design criteria, Flow rates, Pressure.

Jets of air directed into the flames from incinerator fuel beds aid in completing the combustion of gases and suspended carbon particles. As the location, sizing, and pressurizing of the overfire air nozzles are important design considerations for air pollution control, tests on overfire air jets were conducted to determine their performance in reducing smoke from a large incinerator furnace. The total amount of excess air was satisfactory, because the carbon dioxide content of the flue gas seldom exceeded 7% dry volume basis. Overfire air velocity measurements in the cold-furnace revealed that velocities declined rapidly within the first 4 feet from the nozzles and then fell off more slowly with distance. The certain sidewall nozzles were particularly weak and would not deliver air to the center of the furnace. Typical velocities are presented graphically, as well as air flow and jet penetrations at 1500 fpm as functions of nozzle diameter and pressure differential. Equations are presented for calculating the flow through an overfire air nozzle and for calculating jet throw for a terminal velocity of 1500 fpm. The second graph is useful for the selection of nozzle sizes and air pressures. A method to increase air penetration from the sidewall air nozzles is also mentioned.
APTIC-22822

LEAD REMOVAL FROM GASOLINE NOT YET CERTAIN—OTHER POLLUTION FACTORS TO BE CONSIDERED.

Petrol. Times, 74 (1898):62, 64, July 3, 1970.
Charles L. Goodacre.
Identifiers: *Gasolines, *Automotive emission control, *Lead compounds, Emission standards, Engine exhausts, Smog, Catalytic afterburners, Flame afterburners, Engine design modification, Catalytic oxidation, Hydrocarbons, Carbon monoxide.

The 'Queensberry Rules' pertaining to exhaust emissions are mentioned, as well as the difficulties encountered with the catalytic afterburner, Man-AirOx, and other attempts to control photochemical smog. Confounding this problem is the recent re-discovery that significant pollution carbon monoxide is apparently coming off the ocean. Certain sea life exudes carbon dioxide and forms a smog like haze on the surface of the sea to some 30-40 meters above the surface. Preceded by 1

year in California, Federal limits set for 1968 cars were unburned hydrocarbons 275 ppm and carbon monoxide 1.5%. Unfortunately, some cars were naturally high emitters, and the makers of such cars started to call for lead-free gasolines when Man-AirOx and UnDetox did not reduce the emissions sufficiently. A chemical company came out with a very expensive thermal reactor which reduced the unburned hydrocarbon emissions from 1000 ppm to 50 ppm and the CO from 5% to 0.50%. Yet, construction required high nickel alloys in an amount that approximates the world's yearly nickel output. The reactor also produced a foul-smelling exhaust with carcinogenic dross and was a potential fire hazard. Standards are becoming stricter, and oil companies have been asked to make lead-free gasoline available for 1972 cars. Hydrocarbon limits for 1970 are 180 ppm and carbon monoxide is limited to 1.1%.
APTIC-22825

THE ADSORPTION OF NITRIC OXIDE ON IRON OXIDES.

J. Catalysis, 18 (2):184-192, Aug. 1970. 15 refs.
K. Otto, and M. Shelef.
Identifiers: *Adsorption, *Iron oxides, *Nitric oxide (no), Catalytic activity, Oxidation, Reduction, Reaction kinetics, Pressure, Temperature.

Adsorption isotherms and rates were measured for NO chemisorption at 26-150 C on supported and unsupported samples of Fe₂O₃ and Fe₃O₄. From 1 to 200 Torr the adsorption behavior was well described by Freundlich isotherms. Monolayer coverage was attained at 500 Torr for the reduced samples and at 25,000 (by extrapolation) on the oxidized samples. Kinetic measurements were evaluated in accordance with the Elovich equation. The plots, which were similar to those reported for oxidized and reduced chromia, were monotonic in the case of supported Fe₂O₃ and showed a sharp discontinuity in the case of supported Fe₃O₄ at theta equals 0.5. As with chromia, the difference in the adsorptive behavior between the reduced and oxidized iron oxide surface appears to be related not the presence of a certain proportion of ferrous ions (magnetite) on the reduced surface but to the presence of the extra oxygen on the oxidized surface, the extra oxygen exerting a strong inhibiting effect on the chemisorption rate. (Author abstract modified)
APTIC-22828

TAKING THE LEAD OUT OF PETROCHEMICALS.

For primary bibliographic entry see Field 10.
APTIC-22829

SOME REMARKS ON AIR POLLUTION BY MOTOR EXHAUST AND OTHER COMBUSTION PRODUCTS.

For primary bibliographic entry see Field 01.
APTIC-22836

DETECTION AND CONTROL OF HYDROGEN POLYSULFIDE IN WATER.

Public Works, 101 (9):113-115, Sept. 1970. 11 refs.
(Presented at the American Chemical Society Meeting, April 1969.)
Joseph T. Monscivitz, and Leonard D. Ainsworth.
Identifiers: *Odors, *Water pollution, *Sulfur compounds, Control methods, Sulfur dioxide, Sulfides, Hydrogen sulfide.

During the processing of ground or surface water supplies containing hydrogen sulfide, post-treatment odors sometimes occur and are usually attributed to deterioration of water quality in the distribution system. Existence of the problem is usually evident by the appearance of a milky-blue turbidity and, upon heating, the pungent odor of hydrogen sulfide. As determined by the authors, the source of the odors is the polysulfides produced by the natural or chlorine oxidation of sulfides. The answer to making the nuisance sulfur

species susceptible to chloride oxidation appears to lie in converting them to a relatively stable sulfate end product, with sulfite ion used as intermediate. The stable sulfate can be oxidized by post-chlorination. While current laboratory tests of materials containing or hydrolyzing to a sulfate ion are centering on sodium metabisulfite, sulfur dioxide may be used in future tests.
APTIC-22837

PHYSICAL SOLVENT STARS IN GAS TREATMENT/PURIFICATION.

Chem. Eng., 77 (19):54-56, Sept. 7, 1970.
John W. Swamy, and John P. Valentine.
Identifiers: *Carbon dioxide, *Hydrogen sulfide, *Solvents, *Natural gas, *Absorption, Costs, Odor counteraction, Alcohols, Ethers, Ethylene, Mercaptans, Sulfides.

Selexol, a new process, is applicable for removing and recovering hydrogen sulfide, in high or low volume, from sour natural gas; full removal of carbon dioxide from sour natural gas and from synthesis gas before conversion to ammonia and methanol; H₂S and CO₂ from refinery processes; and carbon oxysulfide, carbon disulfide, and other sulfur compounds from a gas stream. A photograph and flowsheet are shown of a Selexol facility at Ft. Stockton, Texas, which removes 97% of the H₂S and 96% of the CO₂ from gas gathered in the Oates field. Capital and operating costs are lower than for chemical-separation methods. Steam regeneration, large cooling systems, and extensive heat-exchange equipment are practically eliminated. Due to its special solvent, the dimethyl ether of polyethylene glycol, the Selexol flowscheme can accept very high loadings of acid gases such as H₂S and CO₂, sulfur compounds like COS, CS₂, and mercaptans without solvent degradation. It also gives extremely quick response to changes in feed-gas composition. The solvent itself is noncorrosive, nontoxic, and inherently nonfoaming.
APTIC-22838

BACTERIAL FILTRATION OF AIR.

Process Biochem., 5 (5):47, May 1970. 1 ref.
J. A. D. Fox.
Identifiers: *Bacteria, *Filter fabrics, Great Britain, Particle size, Membrane filters, Design criteria, Flow rates.

A filter which combines the advantages of both depth-type and membrane filters is described. The filter, called Ultipor 1, has controlled pore size, adequate service life, a means of ensuring good seals, is steam resistant, and can be corrugated into high surface area cartridges. The filter is available in two grades, 0.35 micron absolute, and 0.8 micron absolute. A non-destructive test involving immersion in a bacteria solution is described. Construction modifications are available, depending upon the size requirements and type of sterilization required. Flow capacities of the filters are shown. Applications include sterilization of liquids, bacterial reduction in enzymes, and protection of ultrafine membrane filters.
APTIC-22852

FUMES IN ALUMINUM SMELTING: CHEMISTRY OF EVOLUTION AND RECOVERY.

J. Metals, 22 (9):54-57, Sept. 1970. 7 refs.
(Presented at the TMS-AIME Annual Meeting, 1970.)
C. N. Cochran, W. C. Sleppy, and W. B. Frank.
Identifiers: *Primary metallurgical processing, *Adsorption, *Hydrofluoric acid, *Aluminum, Fumes, Centrifugal separators, Electrostatic precipitators, Bag filters, Scrubbers, By-product recovery, Fluorides, Aluminum oxides.

Traces of gaseous and particulate fluoride must be removed from the effluent of aluminum smelting cells. Fluoride emission, both particulate and gaseous, increases with increase of temperature and

decrease of bath ratio and aluminum oxide content. Hydrogen fluoride from reaction of moisture with aluminum fluoride-containing bath species increases with increasing partial pressure of H₂O. The water vapor originates from the atmosphere, from constitutional water or water adsorbed on the aluminum oxide or from burning of hydrogen or hydrocarbons from the anodes. The particulate is removed by electrostatic precipitators, mechanical precipitators, scrubbers or bag filters. Gas scrubbers or adsorption on aluminum oxide are used for removal of HF. Adsorbing HF on aluminum oxide as a chemisorbed monomolecular layer permits recovery of the sorbed fluoride and the direct return of the fluoride to the pot. The chemisorbed fluoride is initially amorphous but forms aluminum fluoride upon heating. Physically adsorbed HF (in contrast to the chemisorbed layer) is re-evolved as HF on adding the recovery product to the pot. Thus, the fume removal process should be limited to the chemisorption reaction. Efficiency of HF recovery with aluminum oxide increases as fume concentration increases and the ratio of recovery product to pot feed increases. (Author abstract)
APTIC-22853

BEFORE BUYING AN EXHAUST SYSTEM TEST FOR DUST CONTROL.

Plant Eng., 24 (19):109-111, Sept. 17, 1970.
John M. Kane.
Identifiers: *Fans (blowers), Dusts, Electric furnaces, Primary metallurgical processing.

Where the solution to in-plant and atmospheric air pollution problems involves substantial capital investment and risk of inadequate performance, onsite determination of exhaust volume requirements will permit confident selection of control equipment. The vane-axial fan is well suited to such exhaust volume studies because of its ease of installation, low cost, and ready availability. When a foundry was experiencing difficulties in controlling dust and steam from dump grates on a squeezer line, two 20-in. vane-axial fans provided the means for developing a satisfactory solution. Another study provided the information needed to design an effective control system for an electric arc furnace operation in a steel plant.
APTIC-22854

A STUDY OF INDIVIDUAL PARTICLE TRAJECTORIES IN ELECTROSTATIC PRECIPITATION.

Carnegie-Mellon Univ., Pittsburgh, Pa., Dept. of Electrical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1968, 148p. 31 refs.
William G. Gensler.
Identifiers: *Particulates, *Electrostatic precipitators, Particle size, Flow rates.

A study concerning the stroboscopic analysis of particle trajectories in electrostatic precipitation is presented. A photographic system was developed and applied to the movement of particles with diameters ranging from 5 to 177 micron. The experiments were directed to the observation of position, velocity, acceleration, shape, orientation and rotation in the interelectrode region as well as at the surface of the passive electrode in a model precipitator. The mean and standard deviation of the transverse and longitudinal velocity for 5-10 micron diameter particles were determined along with the intensity of turbulence with and without corona. The fluctuating velocities were isotropic. There was no increase in the intensity of turbulence when corona conditions were imposed. Two types of entrance ducts were tested. The use of a plenum at the entrance to the electrode duct reduced the level of turbulence 50% over the turbulence level with an expansion type entrance duct. Particles in the 37-177 micron range were tested for rotation and orientation near the collecting electrode. The vast majority of particles exhibited no rotation. No preferential orientation was observed. (Author abstract modified)
APTIC-22895

THE PRESENT STATE OF DEVELOPMENT OF OIL-FIRING EQUIPMENT FOR HIGH-DUTY BOILERS.

(Der heutige Entwicklungsstand der Oelfeuerungen fuer grosse Kessel). Text in German. Mitt. Ver. Grosskesselbesitzer, 49 (2):86-92, April 1969. 1 ref.
W. Lenz.
Identifiers: *Boilers, *Combustion air, *Aerosol generators, Germany, Centrifugal separators, Firing methods, Combustion.

Development work is proceeding on oil-firing equipment with an oil consumption exceeding 10 tons/hour per individual burner. Atomizers working on 3 atomization principles based on centrifugal force, on pressure, and on atomizing agents which all result in near stoichiometric combustion are described. An innovation in centrifugal atomizers is oil supply delivered directly into the fast rotating atomization cup. Pressure atomizers work always with a swirl nozzle because atomization with a hole-type nozzle yields too narrow a stream for intimate mixing with air. Atomizers working with atomizing agents use steam or compressed air depending on cost consideration: but mostly steam. Air supply heads insure ignition by intimate mixing of the oil fog with air. Air can be supplied with or without a nozzle. A low level of excess air requires high air velocity in order to insure good mixing. The venturi parallel stream head works without a nozzle and gives a long flame. The construction of the Steinmueller head supplies air of constant velocity. To stabilize the flame at high air velocities, so-called impellers or ignition screens are used. The toroidal burner developed by Shell works on the principle of return feeding of hot flue gases. Rotating self-cleaning filters are used with oils of high solid matter content. Gas-electric ignition burners with infrared or ionization control devices are used to effect ignition. Measuring and regulatory devices designed to insure near stoichiometric combustion in a sharply fluctuating operation, safety devices, and devices insuring semi-automatic or automatic operation of oil firing equipment are described.
APTIC-22903

THE FILTRATION MECHANISM OF MEMBRANE FILTERS.

(Zur Frage der Filtrationsmechanismen bei Membranfiltern). Text in German. Staub (Duesseldorf), 24 (7):250-256, July 1964. 26 refs.
Kvetoslav Spurny, and Josef Pich.
Identifiers: *Operating variables, *Membrane filters, Czechoslovakia, Electrostatic precipitators, Gravity settling, Diffusion.

By choosing a capillary model of a membrane filter, the filtration mechanism can be studied from the caption of aerosol particles in the inner walls of a capillary of a diameter of from 0.0001 to 0.00001 cm and of an approximate length of 0.01 cm and from the impaction on the area around the circular capillary opening. The tubular pore with its corresponding impaction surface is the filtration element of membrane filters. Besides diffusion and impaction, other mechanisms like electrostatic precipitation, gravitational separation, and direct caption can be operative, but their influence on filtration is small. Impaction and diffusion are consecutive processes. First, the larger particles are separated through inertia on the filter surface around the mouth of the pores, and only then particles which penetrate into the capillary are captured on its inner walls primarily by the action of diffusion. The validity of these assumptions was tested by means of radioactively marked condensation aerosols prepared from NaCl, AgI, H₂SO₄, and H₄P₂O₇; results when compared with theoretical data arrived at by calculations based on the above model were in good agreement.
APTIC-22904

PROCESSING ENGINEERING PRINCIPLES OF SO₂ SEPARATION FROM FLUE GASES.

(Verfahrenstechnische Grundlagen der Abscheidung von SO₂ aus Abgasen). Text in

German. Inst. Gewerbliche Wasserwirtschaft Luftrein-Haltung Forum, 1965:359-374, 1965. 21 refs.

H. Juentgen.

Identifiers: *SO₂ removal (combustion products), Germany, Stack gases, Electric power production, Catalytic oxidation, Adsorption (general), Sulfuric acid, Catalysis, Reduction.

Wet separation of sulfur dioxide from flue gases was unworkable because the cooling of flue gases by the washing liquid led to their loss of buoyancy and to subsequent accumulation of high levels of SO₂ in the vicinity of the stack, in spite of its thorough separation. The main problem of SO₂ separation lies in the large volume of flue gases from thermal power plants and the low SO₂ concentration of from 0.5 to 1.5 ppm which is only 1% of the SO₂ content in roasting gas. Processes recently proposed to solve these problems based on the reaction of SO₂ with metal compounds to form sulfates, on the adsorption on carbonaceous adsorbents (semicoke and activated carbon) with a simultaneous conversion to sulfuric acid (the so-called clean air method, the Pauling, and sulfacid method), and on the catalytic oxidation of SO₂ to SO₃ on conventional vanadium catalysts with the subsequent washing out of the SO₃ (methods developed by the Bituminous Coal Research Inc., and the Pennsylvania Electric Co.) are described. Some of these processes have been tried out on a pilot plant, semi-industrial and even industrial scale; their cost can at this point be only estimated. Experts are unanimous in the prediction that none of the processes proposed will be economically feasible; thus, the removal of SO₂ from flue gases is still an expensive procedure.

APTIC-22905

TREATING GASES CONTAINING SULPHUR VAPOUR.

(Guggenheim Brothers, New York) U. S. Pat. 1,972,885. 3p., Sept. 11, 1934. (Appl. March 31, 1932, 8 claims).

George H. Gleason, and Alfred C. Loonan.

Identifiers: *Packed towers, *Vapor recovery systems, *Sulfur compounds, Tar, Suspended particulates, Liquids, Temperature.

Gases containing sulfur vapor are scrubbed with liquid sulfur in order to remove contaminants from the gases prior to condensation to recover the sulfur vapor. The gases are contacted with the liquid sulfur at an initial temperature of about 350-350°C; in the course of contact, the temperature of the gas is lowered by about 100°C and the liquid sulfur collects the solid particles carried in suspension in the gases and condenses the tar and other volatile contaminants. The countercurrent flow of the gases and the liquid sulfur is achieved by passing the gases up through a packed tower through which the liquid sulfur descends.

APTIC-22906

PRODUCTION OF ELEMENTAL SULPHUR.

(Texas Gulf Sulphur Co., Houston) U. S. Pat. 1,904,482. 2p., April 18, 1933. (Appl. July 26, 1930, 3 claims).

Nils Erik Lenander.

Identifiers: *By-product recovery, *Carbon disulfide, *Catalysts, *Reduction, Europe, Primary metallurgical processing, Aluminum oxides, Sulfur dioxide.

A method is described for liberating elemental sulfur from carbon disulfide when the latter is part of a gas mixture, by reacting the carbon disulfide with sulfur dioxide in the presence of a catalyst at temperatures of 300-500°C. The recommended catalytic mass is aluminum hydrate mixed with cement and aluminum powder and formed into a sludge, which after hardening may be used either directly or in pulverized form. When treating gases from metallurgical operations, fine particles of solid matter should first be removed from the gas mixture to avoid destroying the catalyst. The method is especially applicable to treating gases

resulting from the smelting of pyrite or other sulfide ore since these gases contain more than enough sulfur dioxide to react with all the sulfur compounds present. In other cases, SO₂ may need to be added in appropriate amounts.

APTIC-22907

PRODUCTION OF ELEMENTAL SULPHUR FROM GASEOUS SULPHUR COMPOUNDS.

(Texas Gulf Sulphur Co., Houston) U. S. Pat. 1,904,483. 2p., April 18, 1933. (Appl. July 26, 1930, 8 claims).

Nils Erik Lenander.

Identifiers: *By-product recovery, *Sulfur compounds, *Catalysts, Cements, Europe, Aluminum oxides, Sulfur dioxide, Reduction.

A catalyst is described for use in producing elemental sulfur by the reaction between a gaseous sulfur compound and another gas (preferably also a sulfur compound). The reacting gases are subjected at an elevated temperature to the catalytic action of aluminum hydrate embodied in a porous cement-like substance. The catalytic material is prepared by mixing a quick binding cement with from 10 to 15% of substantially pure hydrate of aluminum and a small amount (0.1-1% by weight) of aluminum powder. These are thoroughly mixed; calcium hydrate and water are then incorporated to form a sludge which is allowed to set after sufficient gas develops within it to produce a porous cement-like product. After hardening, the mass may be used directly or first pulverized.

APTIC-22908

THE CHARGING OF SMALL PARTICLES FOR ELECTROSTATIC PRECIPITATION.

Westinghouse Research Labs., Pittsburgh, Pa., Scientific Paper 60-94433-6-P1, 19p., Jan. 3, 1956. 10 refs. (Presented at the American Institute of Electrical Engineers Winter General Meeting, New York, Jan. 30-Feb. 3, 1956, Paper 56-353.) G. W. Hewitt.

Identifiers: *Particle size, *Electrostatic precipitators, *Electric charge.

Electrostatic precipitation is used extensively in air conditioning applications to reduce the blackening of walls, furnishings, and other exposed surfaces. Since about half the blackening is attributable to particles between 0.1 and 0.6 micron in radius, experimental information was obtained on the charging of these fractional-micron particles in air as a function of particle size, field strength, ion concentration, and charging time. Dioctyl aerosols were charged in a device designed to provide independent control of field strength, ion concentration, and charging time. Particle size was measured by light-scattering methods and by charge-mass measurements. For each charging field, there was a particle size at which particle mobility or charges reaches a minimum. The minimum increases rather rapidly with field strength. Particles most difficult to precipitate are those between 0.1 and 0.2 micron radius. In addition to showing the mobility obtained by thermal charging alone, plots of mobility vs. charging gradient indicate that additional mobility is produced by a charging field and is approximately proportional to the strength of the field. Field is an important factor, even for particles as small as 0.07 micron. At low charging gradients, the experimental results agree reasonably well with theory. At low charging gradients, the experimental results agree reasonably well with theory. At the higher gradients, and for the smaller particles, the experimental charge is considerably greater than theoretical charges, thermal or field. Specifically, at Nt (the variables concentration and time appear in charging equations only as the product Nt), equals 10 the plus seventh power the particle charge changes more rapidly with Nt than theory predicts. The statistical variation of particle charge rises rapidly as Nt decreases below 10 to the plus seventh power.

APTIC-22912

ATMOSPHERIC EMISSIONS FROM WET-PROCESS PHOSPHORIC ACID MANUFACTURE.

NAPCA Pub. AP-57, 86p., April 1970. 39 refs.

CFSTI: FB 192222

Personal Author Not Recorded.

Identifiers: *Fertilizer manufacturing, *Scrubbers, *Phosphoric acid, Impingers, Spray towers, Venturi scrubbers, Hydrofluoric acid, Fluorides, Silicon compounds.

In 1966, the production of wet-process phosphoric acid, expressed as P₂O₅, was approximately 3.5 million tons. Much of this was produced as 54% P₂O₅, and virtually all of it was used to produce various phosphate fertilizers. Fertilizers are produced by treating phosphate rock with wet-process phosphoric acid to form triple superphosphate, TSP, or by reacting phosphoric acid with anhydrous ammonia to form ammonium phosphates, especially diammonium phosphate, DAP. The emissions of most concern are fluoride compounds liberated from the phosphate rock by sulfuric acid: hydrogen fluoride, silicon tetrafluoride, and some products of reaction and decomposition of the latter. Vapor scrubbing is universally employed to control emissions, while specific devices used for control include venturi scrubbers, impingement scrubbers, and various kinds of spray towers. The major source of gaseous fluoride emissions in wet-process phosphoric acid plants is the digester. Emissions and methods of emission control are discussed in detail, and sampling and analytical techniques are summarized. Wet-process phosphoric acid manufacture is described, as well as growth of the industry.

APTIC-22913

METHOD FOR THE PRODUCTION OF SULPHUR BY MEANS OF REDUCTION OF SULPHUR DIOXIDE.

(Assignee Not Given.) U. S. Pat. 2,050,708. 1p., Aug. 11, 1936. (Appl. June 13, 1934, 4 claims).

Axel Rudolf Lindblad.

Identifiers: *Cements, *SO₂ removal (combustion products), *Aluminum oxides, *Reduction, Sweden, Combustion gases, By-product recovery, Iron compounds, Manganese compounds, Carbon monoxide, Catalysts.

The sulfur dioxide in gases produced from roasting sulfurous ores is reduced with carbon monoxide in the presence of a catalyst of a cast aluminate cement ('smelt cement') containing at least 25% Al₂O₃ alone or in mixture with iron or manganese compounds. The reduction process is carried out at a temperature of from 350 to 650°C.

APTIC-22920

INDUSTRIAL APPLICATIONS OF WIND TUNNEL INVESTIGATIONS.

For primary bibliographic entry see Field 14.

APTIC-22922

VOLATILE FLUORIDE RECOVERY.

(Standard Oil Co., Cleveland, Ohio) U. S. Pat. 2,440,542. 3p., April 27, 1948. 7 refs. (Appl. July 17, 1942, 18 claims).

Everett C. Hughes.

Identifiers: *Fluorides, *Absorption, *By-product recovery, Scrubbers, Hydrofluoric acid, Temperature, Volatility.

Volatile fluorides, such as boron fluoride and hydrogen fluoride, used in catalytic operations are discharged in admixture with themselves or with hydrocarbons. While the fluorides can be separated by fractional distillation and condensation, this method is expensive and in many cases not profitable. In contrast, the fluorides can be conveniently recovered with relatively little expense by exposing gas containing them, in countercurrent flow in a tower, to dihydroxyfluoroboric acid. Part of the fluoride is absorbed at about 27-55°C while the remainder is liberated by raising the temperature of the acid to 120°C or above. As an example, gas containing hydrogen fluoride at 1

atm was subjected to absorption at 35.2 C, and 91% by weight of HF was absorbed. By raising the temperature to 170 C, 95.7% by weight of HF was recovered. The acid is recycled to contact fresh incoming gas.
APTIC-22923

THE EFFICIENCY OF MEMBRANE FILTERS.
Intern. J. Air Water Pollution (London), vol. 7:501-509, 1963. 12 refs.
W. J. Megaw, and R. D. Wiffen.
Identifiers: *Efficiency, *Membrane filters, Great Britain, Aerosols, Particle size, Diffusion.

Experiments are described in which the efficiency of type AA Millipore filter was determined at a particle diameter of 0.02 micron, using aerosols of potassium permanganate and radioactive tungsten. No significant penetration of the filter by particles of this size, at a face velocity of 40 cm/sec, was detected either by particle counting techniques using a Pollak counter or by radioactive methods. These results contradict those reported earlier by FITZGERALD and DETWILER. The performance of the filter in this size range is not dependent on electrostatic effects and is predictable theoretically if it is assumed that diffusion is the sole filtration mechanism. Larger particles which are still, however, smaller than the filter pores and for which diffusion processes are ineffective are also trapped with efficiencies of 100%. Removal of the electrostatic charge of the filter does not alter its efficiency, and it is concluded that such particles must be trapped by impaction in the filter pores. (Author abstract modified)
APTIC-22929

AN EXPERIMENT IN CREATING PROTECTIVE PLANTINGS IN THE CITY OF KRASNOURAL'SK.
For primary bibliographic entry see Field 08.
APTIC-22930

REDUCTION OF EMISSIONS FROM THE CURTISS-WRIGHT ROTATING COMBUSTION ENGINE WITH AN EXHAUST REACTOR.
Preprint, Society of Automotive Engineers, Inc., New York, 11p., 1970. 15 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 12-16, 1970, Paper 700074.)
David E. Cole, and Charles Jones.
Identifiers: *Exhaust reactor, *Engine exhausts, Internal combustion engines, Rotary piston engines, Automotive emission control, Engine design modification, Design criteria, Temperature.

The Curtiss-Wright RC2-60 engine exhaust emissions were measured, with and without an exhaust reactor, under steady-state conditions at the University of Michigan and in a vehicle operated on the simulated California cycle at an independent facility. The reactor successfully reduced the emission levels in both cases. Data are presented for the steady-state trends of engine emissions as a function of engine performance variables; trends are generally similar to those of conventional gasoline engines. The particular effectiveness of an exhaust reactor with the RC engine is attributed to port characteristics and higher exhaust gas temperatures unique to this engine together with new reactor design features. Theoretical considerations and future investigations are discussed. (Author abstract modified)
APTIC-22932

COMMUNICATIONS ON THE SEPARATION OF AIRBORNE DUST PARTICLES.
Inst. Mech. Engrs. (London) 1B:203-204, 1952-1953.
H. L. Green, and D. J. Thomas.
Identifiers: *Particle size, *Filters, *Particle growth, Great Britain, Particulates, Mathematical analyses.

Abatement of dust by supersonic methods of agglomeration and theories of the filtration of airborne particles are discussed. Where supersonic agglomeration methods have produced no results, it is likely that the physical and chemical properties of particles have been overlooked. Particles of different substances have completely different powers of agglomeration and constancy of secondary particles. Langmuir's expressions for particle filtration were based on the combined effects of interception and diffusion. The effect of inertia was ignored. Over a fairly wide range of particle size, experimental evidence on the performance of various types of fibrous filters indicate that the Langmuir theory tends to overestimate the absolute efficiency. Another theory that introduces the inertia term shows the reverse trend. Conclusive evidence of filter penetration and particle size relations awaits studies of particle sizes less than 0.01 micron radius and investigations of electrostatic effects.
APTIC-22933

AN ANALYTICAL FRAMEWORK FOR THE STUDY OF EXHAUST MANIFOLD REACTOR OXIDATION.
Preprint, Society of Automotive Engineers, Inc., New York, 12p., 1970. 8 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 12-16, 1970, Paper 700109.)
Richard C. Schwing.
Identifiers: *Exhaust manifold reactor, *Mathematical modeling, Engine exhausts, Internal combustion engines, Afterburners, Air-fuel ratio, Engine design modification, Hydrocarbons, Carbon monoxide, Oxidation, Reaction kinetics.

A mathematical model is formulated which accounts reasonably well for experimental observations made on the steady-state performance of an insulated exhaust manifold reactor when connected to a single-cylinder engine. The model, which is based on chemical reaction kinetics and energy balance considerations, predicts the effects of air-fuel ratio and dilution air quantity on the reduction of carbon monoxide and hydrocarbons in engine exhaust gas. A description of the model development, a discussion of qualitative relationships, and a comparison of quantitative predictions made from the model to experimental results are included. (Author abstract modified)
APTIC-22937

AN EXPERIMENTAL BATTERY POWERED FORD CORTINA ESTATE CAR.
Preprint, Society of Automotive Engineers, Inc., New York, 8p., 1970. 6 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 12-16, 1970, Paper 700024.)
L. R. Foote, and J. F. Hough.
Identifiers: *Storage batteries, *Automobiles, Engine design modification, Design criteria.

The design of the Ford Cortina Estate Car converted to propulsion by currently available batteries is described, and results for power train component performance test and vehicle driving characteristics are given. Concept and purpose of this test vehicle are discussed, and chassis and body modifications are described. Design of the electric power train, employing a dc commutator motor and dc solid state chopper controller, is developed. The car instrumentation is described and operating experience in several driving modes is reported. A discussion of battery characteristics is included. (Author abstract modified)
APTIC-22938

BOLIDEN IMPROVES WORK AT RONNSKAR SMELTER.
Eng. Mining J., 139 (9):54-55, 1938.
A. G. Paul Palen.
Identifiers: *Pyrites, *Primary metallurgical processing, *By-product recovery, Iron, Sweden, Stack gases, So₂ removal combustion products, Iron compounds, Catalysis, Reduction.

A flotation process for separating arsenopyrite and copper pyrite from barren pyrite was developed by a Swedish smelter, thus decreasing the tonnage of ore to be smelted and improving the metallurgical practice. The concentrator treats pyrite ore and siliceous ore derived from mineralized wall rock. The pyrite ore yields a smelting concentrate and a pyrite concentrate with about 5.5 sulfur and practically free from copper and precious metals. The siliceous ore gives a smelting concentrate and waste. The ore that goes directly to the smelter is now finer than before since it passes a screen with slots 7 times 12 mm as against 15 times 32 mm. This has greatly improved the reverberatory work, especially when running on a mixture of flotation concentrates of crushed ore. With the decreased amount of material to be treated (700 tons daily instead of 1000 tons), eight 7-m diameter roasting furnaces are sufficient. However, the smelter has introduced wet refining processes to recover arsenic and selenium. To protect forests against smoke damage, sulfur dioxide in roaster gases is catalytically reduced by a reducing gas to elemental sulfur.
APTIC-22940

NATURAL GAS FUELED VEHICLES EXHAUST EMISSIONS AND OPERATIONAL CHARACTERISTICS.
Preprint, Society of Automotive Engineers, Inc., New York, 23p., 1970. 8 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 12-16, 1970, Paper 700078.)
R. W. McJones, and R. J. Corbell.
Identifiers: *Engine exhausts, *Natural gas, *Internal combustion engines, Fuel tank evaporation, Carburetor evaporation losses, Soot, Gasolines, Operating variables, Air-fuel ratio, Hydrocarbons, Tetraethyl lead, Carbon monoxide, Nitrogen oxides.

Natural gas fuel in a lean mixture with 25% excess air operates satisfactorily in an otherwise normal automotive engine. All exhaust emissions known to contribute to air pollution are reduced to levels meeting or bettering currently proposed standards. For example, carbon monoxide, lead, and soot are virtually eliminated, while oxides of nitrogen and hydrocarbons are reduced significantly. Emissions from carburetor and fuel tank evaporation are nearly zero. Dual-fuel operation with gasoline as a standby fuel permits immediate use of natural gas prior to the establishment of a widespread fueling network. (Author abstract modified)
APTIC-22941

CONVERSION OF CARBON MONOXIDE AND ITS CATALYSTS.
(Issankatanso tenka hanna to sono shokubai).
Text in Japanese. Nenryo Kyokaiishi (J. Fuel Soc. Japan, Tokyo), 46 (487):802-818, 1967. 98 refs.
Yoshiro Morita, and Koji Tsuchimoto.
Identifiers: *Carbon monoxide, *Catalysis, Japan, Natural gas, Hydrogen, Chromium compounds, Cobalt compounds, Copper compounds, Iron compounds, Molybdenum compounds, Zinc compounds, Oxides, Sulfides, Chemical reactions, Reaction kinetics, Reaction mechanisms, Pressure, Temperature.

The shift reaction of carbon monoxide is mainly used to produce hydrogen gas and to detoxify CO in gas for domestic use. Together with a brief theoretical consideration of this reaction, the values for equilibrium constants, heat of reaction and free energy are tabulated for various temperatures. Also presented is a list of rate equations, catalysts, pressures, temperatures, and the scientists who developed each equation. The CO conversion catalysts employed in industries fall mainly into two categories: the iron-chromium oxide (high-temperature) catalyst and the copper-(chromium)-zinc oxide (low-temperature) catalyst. The latter is very active at low temperatures, but is expensive and sensitive to sulfur compounds. Recently a cobalt molybdenum sulfide catalyst was found to be very active for CO conversion reaction at 300-400 C, and it is being tested on the

pilot plant scale today. Finally some types of converters and conversion processes for industrial purposes are introduced, with the general mechanism shown diagrammatically.
APTIC-22942

ELIMINATING DUST IN CHEMICAL PLANT.

Chem. Age, (New York), vol. 77:431-433, March 9, 1957.
Rolt Hammond.
Identifiers: *Dusts, *Chemical processing, *Control equipment, Stack gases, Particle size, Impingers, Collectors, Electrostatic precipitators, Filters, Wet cyclones, SO₂ removal (combustion products), Hydrochloric acid, Hydrofluoric acid, Sulfuric acid, Hydrogen sulfide.

Among new equipment for eliminating dust from chemical plant flue gases is a multi-wash collector that removes submicron particles with maximum efficiency. The collector comprises a cylindrical stainless steel tower with six and one-half vane impingement stages. An entrainment separator placed above the units forms a seven-tier. Air enters the tower just below its conical base, which acts as a wet cyclone to collect the heavier particles upon entry. A water curtain descending from the top of the tower combines with spray and impingement to envelop the particles rising with the air, carrying them down into the cone and out of the collector. When most of the dust is above the submicron range, collectors with fewer stages are employed. These collectors are equally effective on both soluble and insoluble dusts and on soluble gases. For the removal of gaseous contaminants such as hydrogen sulfide, sulfur dioxide, hydrochloric or hydrofluoric acid vapors, alkaline solutions are added to the recirculated liquid. For the 0.1 to 5 micron particles found in pharmaceutical and bacteriological work, an esparto grass-based paper filter with asbestos fibers has an efficiency of 99.95%. This filter can be accommodated in a very small place. A reverse-jet type filter has proved very efficient for vaporized silica of 0.6 micron and less. Electrostatic precipitators are used to remove dust and fumes from pyrite roasters, sulfuric acid mist from wet catalytic sulfuric acid plants, and sulfuric acid mist from coal roaster gases. Static rectifiers for the precipitators are available that dispense with the high-tension connections formerly required. Alternating current is rectified and used without high-frequency effect on the wave-form, as in the case of mechanical rectifiers.
APTIC-22943

SOME FACTORS TO CONSIDER IN THE DESIGN AND APPLICATION OF AUTOMOTIVE IGNITION SYSTEMS.

Preprint, Society of Automotive Engineers, Inc., New York, 15p., 1970. 4 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 12-16, 1970, Paper 700083.)
Paul C. Kline.
Identifiers: *Internal combustion engines, *Spark timing, *Design criteria, Engine exhausts, Engine design modification.

Ignition is such a vital factor in the performance, reliability and service life of the internal combustion gasoline engine that its basic design and application deserve major attention from the engine designer. The electrical and mechanical functions of present-day standard, or 'Kettering' type ignition systems are reviewed, and potential design and application problems, together with ways to avoid them, are discussed. Distributor mounting and drive, environmental factors such as moisture and dirt, radio frequency suppression, and exhaust emission considerations are briefly discussed. Spark advance determination to control exhaust emissions is described from a design viewpoint. Advantages and limitations of typical semiconductor systems are also presented because these comparatively new systems offer major advantages that, on many applications, more than justify their premium initial cost. (Author abstract modified)

APTIC-22944

DETERMINATION OF INDUSTRIAL STACK HEIGHTS.

For primary bibliographic entry see Field 14.
APTIC-22945

THE FIRST YEAR'S EXPERIENCE OF THE ALAGASCO LNG PLANT.

Preprint, American Gas Association, Inc., New York, 14p., 1966. (Presented at the American Gas Association Production Conference, Baltimore, Md., May 23-24, 1966.)
B. C. Lorig, and A. W. Mellen.
Identifiers: *Natural gas, *Operating variables, *Compression, Scrubbers, Design criteria, Carbon dioxide, Hydrogen sulfide, Heat transfer, Compressed gases.

At a newly constructed liquefied natural gas plant, feed gas is first compressed in a 2000-hp integral gas engine-driven compressor that is used also to compress the propane, ethylene, and methane refrigerants. From the compressor, the feed goes to a monoethanol amine scrubber where carbon dioxide and hydrogen sulfide are removed. These gases, if left in the feed, would freeze at cryogenic temperatures and consequently plug the heat-exchanger passages. On leaving the amine unit, the feed enters dehydrators where moisture in the gas is removed by activated carbon. After pre-treatment, the feed is cooled in external heat exchangers by propane. The remainder of the processing occurs in a cold box containing the heat exchangers that transfer heat from the feed gas being liquefied to the refrigerants in the cascade system. Interesting features of the process cycle are hexane removal and nitrogen rejection columns. Separation of the heavy hydrocarbons at the point of liquefaction prevents them from freezing and clogging the heat exchanger passages. The nitrogen rejection column effectively removes up to 3% nitrogen at minimum horsepower. Storage is in an aboveground 175,000 barrel tank with a 9% nickel steel inner shell and a carbon steel outer shell. For send-out, LNG is pumped to vaporizers where the firing rate is automatically adjusted to provide 40 F exit temperature and to prevent cold gas or liquid from entering the distribution system. In its first year, the plant has liquefied over 170 million cu ft of gas and sent out 100 million cu ft. Except for minor design changes in the vaporizers, start-up problems were limited to minor mechanical failures.
APTIC-22947

DETERMINING THE EFFICIENCY OF AIR FILTERS.

Water Works Wastes Eng., vol. 1:50-54, Jan. 1964. 5 refs.
A. H. Chasick, and R. L. Bootes.
Identifiers: *Efficiency, *Electrostatic precipitators, Particle size, Filters, Filter fabrics.

Comparative tests were conducted of the Whatman paper thimble, aluminum oxide ceramic thimble, and fiber-glass disk methods of sampling the performance of a high-efficiency electrostatic-agglomerator, extended-surface collector filter system. The trials demonstrated the superiority of the fiber-glass disk in removal of dust particles down to 0.32 micron, in diameter in accuracy of weighing, and in convenience of handling. These properties should make the fiber-glass disk the method of choice as a standard test of high-efficiency filters. Plant results with the disk proved that the electrostatic-agglomerator filter system had a dust-removal efficiency exceeding 98% of the dust in atmospheric air, and provided a filtered air containing not over 0.05 mg per 1000 cu ft.
APTIC-22948

PROTECTION AGAINST DIRTY ENVIRONMENTS: FILTRATION.

Proc. Inst. Mech. Engrs. (London), 182 (3A):442-448, 1967-1968. 37 refs. (Paper 27.)
R. M. Wells.

Identifiers: *Particulates, *Centrifugal separators, *Filter fabrics, Great Britain, Membrane filters, Glass fabrics, Screen filters, Gravity settling, Inertial separation, Design criteria, Flow rates, Gases, Liquids, Pressure.

Solid contamination in the form of particulate matter can cause damage to the pumps and valves of a lubrication system. Contamination can be removed from a lubricating fluid by filtration, centrifugation, or settling. Full flow-rate filtration may be employed at a number of positions in the system. Centrifugal clarification has the additional advantage of water separation as well as particle removal. Air intake filtration guards against the introduction of air-borne particles. Filter parameters are discussed, including differential pressure versus flow rate, efficiency of removal, and holding capacity. Filter element materials include paper, glass, wool, powders, woven wire, and membrane filters. Filter design can be of the in-line type or the bowl-type, and can be permanent or disposable. Particle removal from a gas can be accomplished by filtration; efficiency measurement methods often involve the methylene-blue test.
APTIC-22949

PINCH-PENNY WAY TO SQUEEZE OUT SULFUR.

Chem. Week, 101 (27):37, Dec. 30, 1967.
Personal Author Not Recorded.
Identifiers: *By-product recovery, *Peter spence process (claus), Costs, Stack gases, SO₂ removal (combustion products), Methanes, Sulfur compounds, Hydrogen sulfide.

A process currently under development promises to be a simple and inexpensive procedure for removing sulfur dioxide from stack gases. Based on the Claus process for treating sour gas, the only major raw material requirement of the new process is methane. In the process, the stack gases are reacted with hydrogen sulfide to obtain water and sulfur. Some of the sulfur is to be recovered, the remainder will be reacted (along with water) with methane to obtain more hydrogen sulfide needed for the basic stack-gas reaction. The hydrogen sulfide is expected to be generated by a thermal rather than a catalytic route. Advantages of the process are that no solid absorbent is needed and that the sulfur recovered is less expensive to transport than sulfuric acid. No unusual corrosion problems are anticipated. The operating costs of a stack gas disulfurizing unit are estimated at \$1.75 - \$1.50/ton of fuel burned, after sale of the recovered sulfur.
APTIC-22950

ABSORPTION OF SO₂ GAS.

(Aryusan gasu no kyusyu). Osaka Engineering Station (Japan), 1p., 1969 (*). Translated from Japanese. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 2p., Oct. 1969.
Hiroshi Sano, and Yoshie Nakamoto.
Identifiers: *Solvents, *Absorption (general), Japan, Combustion gases, SO₂ removal (combustion products), Hydrocarbons, Oxidation, Ph.

Various sulfur dioxide-absorbing solvents were examined in terms of water solubility and oxidation losses. The types of solvents tested were DMSO, DMF, dioxan, cellosolve, pyridine, phenol-ether, and hydrocarbons. Good SO₂-absorbent solvents do not mix well with water and are either neutral or acidic. Phenol-ether such as anisol are good absorbents.
APTIC-22957

FLUID-BED COMBUSTION OF SOLID AND LIQUID FUELS AND WASTES.

(Fluidni spalovani tuhych a kapalných paliv a odpadů). Inst. Fuel Research, no. 14, 59p., 1969. 42 refs. Translated from Czech. Belov and Associates, Denver, Colo., 57p., Jan. 30, 1970.
Pavel Novotny.

Identifiers: *Fuels, *Fluid-bed combustion, Czechoslovakia, Fly ash, Coal, Pulverized fuels, Alkaline additives, Design criteria, Oxidation, Combustion, Fluid flow.

Fluid-bed combustion generally describes the oxidation reaction that takes place in the fluid layer. The fuels used can be solid, liquid, gaseous, or any combination of these. Some basic observations concerning fluid-bed technology are made. The theory of operation of the fluid-bed involves turbulent fluid flow and mass exchange. Mathematical relationships of fluid-bed phenomenon are determined. Fluid-bed combustion has the potential ability to effectively bind oxides of sulfur to alkaline additives by a drying method. It can also utilize a greater size range of coal fuel, and it reduces the ash content in the effluent. Designs of various fluid-bed reactors are given. Research into the combustion properties of various fuels is discussed.

APTIC-22961

ELECTROSTATIC FILTERS IN THE INTAKE AND EXHAUST OF VENTILATING SYSTEMS. (Elektro-Luftfilter in Be- und Entlüftung-Anlagen). Text in German. Metall, 20 (4):346-351, April 1966.

H. J. Ochs.
Identifiers: *Electrostatic precipitators, Costs, Germany, Dusts, Operating variables.

The history of electrostatic filters, a description of their structure and operation, their efficiency in the removal of dust, procedures used for testing such equipment, the range of use in industry, some specialized types of the filter that have been developed, and a prognosis of future uses is given. At the present state of technological development, the electrostatic filter is the most effective and the most economically-operated type of dust removal device, and it provides an extremely long lifetime of use when properly maintained. Its most serious drawback is its high installation cost, and in cases where more economical equipment can provide sufficiently effective dust removal to conform to the local requirements, it is not recommended.

APTIC-22963

METHOD OF RECOVERING SULPHUR FROM CARBONYL SULPHIDE.

(General Chemical Co., New York) U.S. Pat. 1,710,141. 2p., April 23, 1929. (Appl. Jan. 21, 1927, 5 claims).

Raymond C. Besser, and Alfred Paul Thompson.
Identifiers: *By-product recovery, *Catalytic oxidation, *S₂ removal (combustion products), Combustion gases, Carbonyls, Organic sulfur compounds, Sulfides, Catalysis, Catalysts, Temperature.

Carbonyl sulfide may be readily decomposed and the sulfur recovered therefrom by controlled oxidation in the presence of activated bauxite. Previous processes for the recovery of elemental sulfur from sulfur dioxide or directly from sulfide ores were rendered commercially inoperable on account of the loss of sulfur in the form of carbonyl sulfide, or by the use of a large amount of steam to effect the decomposition of this substance. When the mixed gases are contacted with activated bauxite at an elevated temperature, such as 300 to 700 C, practically no water vapor or its constituents are required to promote the oxidation. Bauxites high in combined water, such as British Guiana and Oolitic bauxites, are particularly active in catalyzing these reactions and retain their catalytic activity for long periods.

APTIC-22966

IMPROVEMENTS IN THE RECOVERY OF SULPHUR FROM GASES.

(Assignee Not Given.) Brit. Pat. 14,628. 3p., June 20, 1912. (Appl. June 20, 1911, 4 claims).
Frank Litherland Teed, Henry Livingstone Sulman, and Hugh Fitzalis Kirkpatrick.

Identifiers: *combustion products), Great Britain. Combustion gases, By-product recovery, S₂ removal (combustion products), Calcium sulfates, Magnesium compounds, Iron oxides, Sulfur compounds, Sulfates, Catalysts, Reduction.

A process for recovering sulfur from gases containing sulfur oxides consists of mixing the sulfurous gases with nonsulfurous reducing gases, such as hydrogen, carbon monoxide, water, or producer gas, and passing the mixture over or through a suitably heated solid contact agent capable of reducing the sulfur oxides to sulfur at about 750-1000 C and with greater efficiency than would be possible in the absence of such an agent. Suitable materials are magnesite, calcium sulfate, and iron oxides. The process is particularly applicable to gases from roasting furnaces, calciners and other equipment in which the oxidation of ores and other materials containing sulfur is effected.

APTIC-22967

EQUIPMENT FOR AIR QUALITY CONTROL.

Pacer, 1 (5):15-39, 1970.

Kenneth U. Meguire.

Identifiers: *Dusts, *Control equipment, Collectors, Centrifugal separators, Electrostatic precipitators, Exhaust systems, Fans (blowers), Scrubbers, Flow rates, Heat transfer.

Control of air pollution created from an industrial process requires the use of equipment which will capture the contaminant in a gas stream, convey the contaminated stream, condition the stream, separate the contaminant from the stream, dispose of it, and deliver the purified stream to the atmosphere. At or adjacent to the originating point of pollution, there is often located a fan or other air/gas mover. Major factors that must be considered in hood design include minimum air velocity needed at the point of emission in order to capture the contaminant, setting the distance from the emission point to the hood, and sizing the hood to capture substantially all of the emission. When an exhaust system is designed, ducts are sized to produce a velocity that not only assures dust entrainment in the stream but also balances duct cost against fan power consumption. Reduction of high temperatures can be accomplished in a number of ways: use of air-air heat exchanger, air-water heat exchanger, by water injection, or by ambient air dilution. Various methods of collecting dust are described, including wet collectors and electrostatic precipitators. Selection of a dust collector and a preliminary list of requirements are mentioned. The principal type of air mover for dust collecting exhaust systems is the centrifugal fan. Fan selection and location, as well as the influence of exhaust characteristics on fan requirement, are also discussed.

APTIC-22972

DISPOSAL OF WASTE EFFLUENTS FROM MOTION-PICTURE FILM PROCESSING.

J. Smpte (Soc. Motion Pict. Telev. Eng.), 79

(9):765-771, Sept. 1970. 10 refs. (Presented at the Society of Motion Picture and Television Engineers Technical Conference, Chicago, Ill., April 27, 1970.)

Lloyd E. West.

Identifiers: *Motion-picture film processing, *Solvents, *Control methods, Chemical processing, Sewage, Sludge, Water pollution.

Chemicals used in motion-picture film processing are evaluated in terms of typical sewer code and stream standard requirements. Air pollution is briefly mentioned in connection with photochemically active solvents used in film lubricants, soundtrack applicators, film cleaners, and lacquers. A solvent that is not classified as photochemically active is available for film processing: methyl chloroform (1,1,1-trichloroethane) inhibited with p-dioxane. However, loss of any volatile chemicals should be minimized by proper use of squeegees or rollers as the film leaves the tank. Tank overflow of overall film lubricant (containing methyl chloroform) may

be distilled for reuse, thus further minimizing pollution. Methods for reducing the discharge of waste effluents include the regeneration of bleach, the recovery of silver, and the use of squeegees. An activated-sludge treatment for processing wastes is recommended to reduce the oxygen-demanding chemicals to an acceptable level. Information is cited for estimating the processing waste load in terms of Biochemical Oxygen Demand. (Author abstract modified)

APTIC-22977

STUDIES ON ASSAM COALS, PART I: CHEMICAL CONSTITUTION RELATING TO SULPHUR COMPOUNDS.

For primary bibliographic entry see Field 01.

APTIC-22981

ALUMINA KILN DUST COLLECTION.

Minerals Process., 11 (8):13-15, Aug. 1970.

A. L. Lyons.

Identifiers: *Aluminum, *Dusts, *Kilns, *Control equipment, Primary metallurgical processing, Centrifugal separators, Electrostatic precipitators, Design criteria, Aluminum oxides, Temperature.

Dust collection systems for hot abrasive materials such as those discharged by an alumina kiln require special design considerations. The system described not only curtails alumina dust losses from belt transfer points but permits the recovery of dust-laden air from fluidized-bed coolers. Ore, which enters the cooler at 600-630 F, is fluidized and cooled to 300 by passing it over water-filled coils. A multiple cyclone and an electrostatic precipitator are employed in series to collect the calcined dust, which is too abrasive for bag filters. Deterioration of duct work and elbows is minimized by seamless pipe and welding fittings. Other components of the collecting system are reducers with specially designed branch entries and a butterfly damper.

APTIC-22983

PATTERN OF COMBUSTION AND GASIFICATION OF COAL IN A CYCLONE CHAMBER.

Thermal Eng. (English translation from Russian of: Teploenergetika), 16 (12):108-111, 1969. 8 refs. V. S. Semenov, and N. A. Semenenko.

Identifiers: *Furnaces, *Centrifugal separators, *Combustion, USSR, Combustion products, Coal, Design criteria.

In order to obtain a high concentration of reducing gases over the entire height of the wall-adjacent zone in a process cyclone, or in order to reach high values of heat release rates for cyclone furnace chambers, it is necessary when designing them to aim at producing conditions which ensure holding a high concentration of coal in suspension over the entire height of the volume of the wall-adjacent zone of the cyclone. This is aided by intensive swirling of the flow and by the development of longitudinal circulation zones. A disturbance of these conditions in vertical cyclone furnaces extended over the height leads to a sharp decrease in heat release rate and to increased removal of unburnt coal particles.

APTIC-22986

THE CHEMICAL COMPONENTS OF ODOR FROM PLASTIC PLANTS AND SOME EXAMPLES OF ODOR CONTROL.

(Purasuchiku koto yori haishutsu sareru akushu kagaku seibun oyobi sono dasabu taisaku). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 1 (1):46-50, April 20, 1970. 2 refs. Toshitake Okuno.

Identifiers: *Chemical processing, *Paint manufacturing, *Odor counteraction, Plastics, Japan, Odors, Esters.

Chemical change of odor bearing waste gas in the course of synthetic resin processing and some odor removal measures in practice at plastic plants

are discussed. Because of the diversity in the synthetic products, odor components and organic compound residues are also different. The typical process for acrylic acid ester compounds production involves a closed reactor to prevent self-polymerization of monomers due to sunlight and oxygen, and polymerization occurs in the nitrogen stream. In this process the monomer-tank, the reactor and the storage tank are the possible sources of odor emission. Characterized by their irritating odor, acrylic acid ester compounds even with a concentration below 1 ppm can be perceived from 20 m away. Adsorption, catalytic oxidation, combustion, and chemical solvents methods can remove this odor. Some examples of odor removal by the use of chemical solvents are demonstrated. In a process where plastic paint is made of resin mixed with other synthetic materials, resin odor stimulates eyes and throat. The result of gas chromatography made on terpene gas has indicated that in a thermal treatment tall rosin was greater in terpene emission than gum rosin. Settling of terpene gas by cooling treatment can be an odor countermeasure due to the difference in the boiling point of terpene gas and resin acid. Some resin acid which is difficult to settle by cooling can be neutralized by an alkaline substance.

APTIC-22988

EXPERIMENTAL STUDIES ON ROTARY DUST COLLECTORS-EFFECT ON TANGENTIAL AND AXIAL INLETS ON PERFORMANCE.

(Kaiten shujinki no seino hi oyobosu ryunyuboshiki no eikyo). Text in Japanese. Funtai Kogaku Kenkyu Kaishi (J. Res. Assoc. Powder Technol., Japan), 259-266, Aug. 1, 1970. 5 refs. Yasuhiko Tanaka, Naoki Yokoo, and Hisashi Shinohara.

Identifiers: *Centrifugal separators, *Flow rates, Japan, Dusts, Particle size, Collectors, Mathematical analyses, Pressure.

A rotary dust collector is a mechanical centrifugal separator provided with an internal rotor supplying a vortex. Performance characteristics of rotary dust collectors are compared with a tangential and an axial inlet. The pressure drop through the device of the axial inlet type is lower than that of the tangential inlet type, while little difference between the two types, is observed in the increase of the pressure drop with the rotor speed. The critical particle size, calculated through the application of simplified assumptions, is nearly proportional to the specific particle size corresponding to the cumulative weight fraction of oversize particles taken to be approximately equal to the measured collection efficiency. The particle size ratio is constant, independent of the gas flow rate and rotor speed, and it is also independent of the rotor diameter in the case of the tangential inlet type. In the case of the axial inlet type, however, the ratio depends on the rotor diameter. In addition, the effect of the number of the rotor disks on the performance is compared for rotors without bars on the periphery.

APTIC-22993

ADSORPTION OF MULTICOMPONENT MIXTURES BY SOLID ADSORBENTS.

For primary bibliographic entry see Field 06. APTIC-22994

QUESTION OF SUPPLYING LOW-S HEAVY OIL.

(Teiwo jyu no kyokyu mondai). Text in Japanese. Netsu Kenri (Heat Management: Energy and Pollution Control), 22 (8):3-10, Aug. 30, 1970. (Proceedings of the National Heat Management Conference, 23rd 1970 (*).)

Takao Sato.

Identifiers: *Costs, *Fuel oils, *Desulfurization of fuels, Japan, Sulfur dioxide.

The currently employed policies for atmospheric SO₂ reduction are: increase in import of low-sulfur heavy oil, encouragement of low-sulfur crude

oil use, and removal of sulfur in residue oil. Heavy oil imported from the Middle East satisfies 90% of the total heavy oil demand of Japan but less considerable sulfur content. The increase in low-sulfur heavy oil imports is not expected to supplement the requirement. Reduction of sulfur in heavy oil can be attained by reducing average 5% in crude oil refining process. Direct and indirect desulfurization in the crude oil refining process are introduced. The main point is to avoid as much decomposition as possible in the process, regardless of the type of original oil. The cost of desulfurization can be broken down into: amortizing, interest and the fixed costs 32.5%, direct, costs 32.7%, hydrogen 34.8%. Various data on uses of petroleum, potential requirements for different types of petroleum, requirements of low sulfur fuel in polluted districts, petroleum import figures are tabulated.

APTIC-22996

THE FUNDAMENTAL ASPECTS OF FILTER TYPE DUST COLLECTOR. PART I.

(Rokashujin no kisochishiki, sono 1). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6 (8):583-587, Aug. 15, 1970. 4 refs. Koichi Iinoya.

Identifiers: *Bag filters, Japan, Dusts, Operating variables, Collectors, Design criteria, Flow rates, Pressure.

The system and some remaining problems of filter type dust collectors are discussed. Since dust collection along with air cleaning is of essential significance in air pollution control, increasing attention has been paid to precipitators and much has been developed in the way of filter-type dust collectors. Compared to the advanced technique and improvement of panel-type filters, bag-type filters are less theoretically developed and at present much of the effective operation has to depend upon empirical knowledge. Several types of bag filters are presented according to different ways of removing collected dusts: They are dust shake-off type, reverse air stream type, local reverse jet type, pulse reverse jet stream type, and sound wave type collectors. Collection efficiency can be improved by using a combination of these, and the combination of the first two types is generally employed. Since the replacement cost of filters is very high, good quality and duration for long use are strongly required. Low pressure-loss and collection efficiency are vital to any dust collector, and problems involved in operation and maintenance are ultimately focused on how to raise collection efficiency and how to reduce replacement cost. Chemical and physical characteristics of various types of filter materials are tabulated.

APTIC-23001

CLOSED SYSTEM ODOR REMOVAL PLANT FOR ANIMAL FIBERS, RUBBISH AND FATS.

(Senkuzu, niber, jushi nado no mippeshohiki ni yoru kanzen dasshu no puranto). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 1 (1):61-65, April 20, 1970.

Takaaki Morikawa, and Taro Fujita.

Identifiers: *Food and feed operations, *Rendering, *Odor counteraction, Japan, Odors, Oil burners, Kilns, By-product recovery, Vapors, Pressure, Temperature.

Manufacturers of cooking oil and livestock feed have been the biggest producers of odor in the community. A disposal plant was established to improve the waste quality and to solve the odor problem at the same time. Raw animal fat of high quality and with 75% oil content is attractive from the standpoint of oil and fat processing. Other animal rubbish and fibers consist of as much as 50% water and gelatine and are rather hard to be utilized for oil and fat processing and also for livestock feed. The main efforts were directed to eliminate the drawbacks of the conventional type of open kilns. The local overheating of the kiln due to the oilburner it uses scorches the materials and results in poor-quality oil and fat byproducts. The

merit of the currently devised plant can be characterized as its closed system. The kiln designed to collect odor bearing vapor and to send it to a pressure reducer where the emission gas is mixed with water for dilution effect. The material can be treated to a better quality under reduced pressure along with less temperature variation according to the kind of raw materials being processed. Odor contained in the vapor can be reduced. The flowchart of this closed system plant and related data are presented.

APTIC-23002

PROCESS FOR THE PRODUCTION OF HYDROGEN SULPHIDE FROM SULPHUROUS GASES.

(Assignee Not Given.) U. S. Pat. 1,407,323. 2p., Feb. 21, 1922. (Appl. Nov. 12, 1919, 4 claims).

Walter James Browning.

Identifiers: *By-product recovery, *SO₂ removal (combustion products), *Reduction, *Hydrogen sulfide, Europe, Combustion gases, Primary metallurgical processing.

A process is described for continuously obtaining hydrogen sulfide from sulfurous gases produced by the burning, combustion, calcination, and distillation, such as from gases produced by the calcination of pyrites and masses in roasting furnaces, gases produced by the treatment of blends, and gases produced by smelting sulfurous ores. It consists in passing the sulfurous gases diluted with air through an incandescent carbonaceous zone in the presence of hydrogen to effect reduction of the sulfur dioxide and trioxide, and to produce hydrogen sulfide by the inter-reaction with the hydrogen of the sulfur obtained by reduction.

APTIC-23007

THE DOMESTIC GAS-FIRED INCINERATOR'S ROLE IN AIR POLLUTION CONTROL.

J. Air Pollution Control Assoc., 6 (2):90-97, Aug. 1956. 15 refs.

F. E. Vandaveer.

Identifiers: *Multiple chamber incinerators, *Catalytic oxidation, Odors, Fly ash, Smokes, Fuel gases, Solid waste disposal, Measurement methods, Odor counteraction, Field tests, Research methodologies, Aldehydes, Nitrogen oxides, Sulfur oxides, Catalysts.

Progress in the development of a smokeless, odorless, fly ash-free, domestic gas-fired incinerator is reported. Test charges and methods for producing and determining odor, smoke, and fly ash were selected. Two-stage incineration with gas heat in both stages is necessary to eliminate smoke and odor from domestic incinerators, the first stage for burning the garbage and paper, the second stage for oxidizing the smoke and odor. For second stage incineration, catalysts impregnated on porcelain or on chrome alloy heated to 500-700 F., ceramic balls or slabs heated to 1400-1500 F., stainless steel grids heated above 1400 F., smokeless downdraft combustion with a gas afterburner, and the flame of a gas-fired afterburner may be used. Drawings of two prototype models of smokeless, odorless and fly ash-free incinerators, and test data on them, are presented. Major changes and additions to gas association requirements for approval of domestic incinerators are reported. Drawings are presented of two commercially-developed incinerators being field-tested, one with a gas-heated catalyst in the second stage and the other with downdraft combustion and a combined incineration burner and gas flame afterburner. Calculations made from published data show that an incinerator in every house in a large city should not cause an increase in nitrogen oxides, sulfur dioxide, or aldehydes in the atmosphere to anywhere near the allowable maximum level for health. (Author summary modified)

APTIC-23008

PROCESS FOR MAKING SULPHUR FROM SULPHUR DIOXIDE.

(American Smelting and Refining Co., New York) U. S. Pat. 1,417,068. 4p., May 23, 1922. (Appl. Sept. 9, 1918, 9 claims).

Identifiers: *By-product recovery, *SO₂ removal (combustion products), *Reduction, Combustion gases, Coke, Primary metallurgical processing, Settling chambers, Bag filters, Sulfur compounds, Condensation, Vapors.

A method is described for recovering sulfur in large quantities economically on a commercial scale from metallurgical gases containing sulfur dioxide. The SO₂-bearing gas is first liquefied and then vaporized in expansion coils to produce an SO₂ gas that is completely pure and free from moisture. The refrigerant supplied by the vaporization process is mixed with a regulated amount of atmospheric air; this refrigerated air is mixed with the pure dry evaporated SO₂ and preheated by the hot exit gases from a reduction furnace. The heated gas mixture is passed into the reduction furnace containing incandescent coke or the equivalent, and the SO₂ is reduced to sulfur by contact with the coke. The cooled exit gases pass through a settling chamber in which the sulfur is collected in part, and then through bags or other filtering device to recover the remainder.

APTIC-23009

METHOD OF PRODUCING ELEMENTAL SULPHUR.

(General Chemical Co., New York) U. S. Pat. 1,695,068. 3p., Dec. 11, 1928. (Appl. Dec. 16, 1926, 9 claims).

Alfred Paul Thompson.

Identifiers: *By-product recovery, *SO₂ removal (combustion products), *Reduction, Combustion gases, Carbon dioxide, Carbon monoxide, Sulfur compounds, Temperature.

Gases containing small amounts of sulfur dioxide may be treated to recover sulfur, and the excess heat developed in the reduction process is efficiently utilized. The danger of fusing or clinkering the ash from the reducing fuel is practically eliminated. According to this method, an endothermic reaction substantially free from hydrogen in any form occurs simultaneously with the reduction of SO₂. The SO₂-bearing gas is mixed with a controlled amount of carbon dioxide, and the mixed gas is contacted with a solid carbonaceous fuel. The temperature is maintained at a sufficiently high level to permit reduction of the CO₂ to carbon monoxide. An oxidizing gas comprising SO₂ is added to these gaseous products to produce approximately interacting proportions of the reducing and reducible gases, leading to the recovery of elemental sulfur. A portion of the exit gas is returned to provide the CO₂ needed in these operations.

APTIC-23010

A NEW TECHNIQUE FOR THE MEASUREMENT OF CORONA FIELD STRENGTH AND CURRENT-DENSITY IN ELECTRICAL PRECIPITATION.

Preprint, Inst. of Electrical and Electronic Engineers, New York, 7p., 1955, 4 refs. (Presented at the American Institute of Electrical Engineers Winter General Meeting, New York, Jan. 30 - Feb. 3, 1956, Paper 56-113.)

P. Cooperman.

Identifiers: *Electrostatic precipitators, *Electric charge, Design criteria, Corona, Voltage.

A probe method was used to measure field-strength and current-density in electrical precipitators. For cylindrical geometry, the measurements were in fair agreement with theory and with previous measurements; in duct geometry, the results indicate that the field strength reaches a minimum in the space between the discharge and passive electrodes. The current-density along the plate goes from a maximum value opposite a discharge

wire to a minimum at a point midway between the wires. There are indications that the field-strength at the plate surface is maximum between the wires; however, this result is uncertain due to the error associated with the low current-density at these points. These results indicate the following with regard to duct precipitators: the charge on collected particles may be higher than would be expected, since these particles must get into the high-field region near the plates; the drift velocity of particles may also be higher near the plates than would be estimated; and for high current-density types of precipitators, efficiency may be a function of current, rather than of voltage. (Author conclusions)

APTIC-23013

REGARDING MAXIMUM ELECTRICAL PARAMETERS OF ELECTROFILTERS.

(K voprosu o predeln'nykh elektricheskikh parametrokh elektrofiltrov). Text in Russian. Izv. Akad. Nauk SSSR Energ. Transp., no. 1:161-166, 1966, 4 refs.

V. I. Levitov, and V. M. Tkachenko.

Identifiers: *Operating variables, *Electrostatic precipitators, *Electrical properties, *Corona, Ussr, Voltage.

Breakdown through atmospheric air in cylindrical corona electrodes under negative applied voltage was studied experimentally for three geometries: 1) conductor-plane; 2) conductor between two parallel planes; 3) coaxial cylinders. Central conductors 1-14 mm in diameter were studied at voltages ranging 40-240 kv over a discharge distance of 20-120 mm (measured from the conductor axis) with consideration given to edge effect. Two characteristic ranges of breakdown voltage were distinguished: a range over which breakdown voltage is independent of the diameter of the corona conductor, and a range over which the breakdown voltage decreases with increased conductor diameter. A maximum breakdown gradient of 20 kv/cm was established.

APTIC-23015

REMOVAL OF DUSTS FROM GASES IN NON-FERROUS AND RARE METAL PRODUCTION USING BAG FILTERS.

(Ochistka gazov ot pyley v rukavnykh fil'trakh proizvodstv redkikh i tsvetnykh metallov). Text in Russian. Tsvetn. Metal., 41 (3):70-74, 1968, 2 refs.

A. S. Mandriko, and I. L. Peysakhov.

Identifiers: *Dusts, *Primary metallurgical processing, *Bag filters, Ussr, Operating variables, Maintenance, Flow rates.

The combined filtering effect and hydraulic resistance of various bag filters together with the accumulated dust are analyzed with consideration given to the effects of cleaning the filter, gas flow rate, and dust concentration. Pulse-type reverse flushing with about 1.7 cu m/sq m-min of air for about 10 seconds is the most effective means of regenerating such filters. It is concluded that bag filters used in metallurgical production can effect almost 100% dust removal when properly used.

APTIC-23023

RECOVERING ASBESTOS FLOATS WITH DUST COLLECTORS.

Rock Prod., 50 (8):104-105, Aug. 1947.

L. J. Wieschhaus.

Identifiers: *Control equipment, *Asbestos, Dusts, Mineral processing, Operating variables, Centrifugal separators, Electrostatic precipitators, Filters, Bag filters, By-product recovery, Gravity settling.

Four properties of asbestos are enumerated which create difficulties in designing a collector for the dust clouds created in milling asbestos: its fibrous nature which causes matting; its friability, creating dust of minute particle size; the caking effects of moisture as particle size decreases; and its low apparent specific gravity, giving the material a 'fluffy' nature.

The advantages and drawbacks of the dust shed, wet processing method, electrostatic collector, and filter type collector are briefly noted. The latter type, when properly applied is well suited to asbestos dust. An example is described in some detail of the successful use of a bag type filter collector in a Canadian plant where a 400,000-cfm unit handles the complete dust load from the mill; about 22 tons per day of marketable asbestos is being collected.

APTIC-23024

MONTREAL INCINERATOR TO BE CLEAN STEAMER.

Eng. News-Record, 183 (6):62-63, Aug. 7, 1969.

Personal Author Not Recorded.

Identifiers: *Design criteria, *Incineration, Canada, Ashes, Solid waste disposal, Electrostatic precipitators, By-product recovery, Steam.

The design features of a new 1200-ton per day incinerator now under construction in Montreal are described. The incinerator has a 2400-ton capacity collection pit to hold wastes dumped by collection trucks. The wastes will go through four completely sealed 300-tpd furnace units designed to keep the temperature range between 1500 and 1830 F to produce a 99.7% burnout rate. Furnace gases will heat water in a complex series of coils, turning it into steam which the city will sell, with the expectation of reducing solid waste disposal costs by half. To control emission of atmospheric pollutants, the flue gases will pass through an electrostatic precipitator. Ash emission level will be under 0.17 lb per 1000 lb of gas, well below official city limits. The manufacturer has given the city a written guarantee of the installation's maximum downtime.

APTIC-23025

RECOVERY OF SULPHUR.

(Guggenheim Brothers, New York) U. S. Pat. 1,972,884. 4p., Sept. 11, 1934. (Appl. March 31, 1932, 8 claims).

George H. Gleason, and Alfred C. Loonam.

Identifiers: *Condensation, *By-product recovery, *SO₂ removal (combustion products), Combustion gases, Design criteria, Sulfur compounds, Cooling, Liquids.

A sulfur condenser is described for recovering sulfur in an easily handled form from sulfur dioxide-bearing gases. To bring the gases into contact with efficiently cooled surfaces of large area, thus rapidly cooling the gases below the viscous temperature range of liquid sulfur, the condensing chamber is surrounded by a liquid (e.g., monochlorobenzene or water under a pressure of 10-30 lb/sq in.) having a boiling point within the lower fluid sulfur temperature range. The droplets of sulfur are collected by constructing the condenser so that the gases bubble through liquid sulfur maintained at a temperature in the lower fluid range one or more times. With this method, it is possible to collect over 94% of the sulfur content of a gas mixture containing only 6.5% sulfur by volume.

APTIC-23026

METHOD OF REMOVING SULFUR COMPOUNDS AND RECOVERING HEAT FROM COMBUSTION GASES.

(American Standard Inc.) U. S. Pat. 3,386,798. 4p., June 4, 1968. 2 refs. (Appl. Nov. 30, 1964, 5 claims).

Rowland S. Bevans, Peter N. Renzi, and Yashwant R. Loonkar.

Identifiers: *Calcium compounds, *Packed towers, *SO₂ removal (combustion products), Stack gases, Steam plants, Scrubbers, Sulfuric acid, Chlorides, Sulfur compounds, Heat transfer, Vapors.

In the method described for recovering heat and removing sulfur compounds from power plant stack gases, the gases are washed with a solution

of 35-45% calcium chloride, the resultant hydrochloric is neutralized, and the calcium sulfur salts removed from the solution, which is then passed into indirect heat exchange with air for use in the combustion chamber. The calcium chloride solution has the advantages of having a higher evaporation temperature than ordinary water, is inexpensive, non-toxic to personnel, and non-corrosive to plant machinery. Sulfuric acid vapor and sulfur dioxide are removed from the stack gases by reacting with the calcium chloride solution to form calcium sulfate, calcium sulfite, and hydrochloric acid, thus reducing pollutants emitted to the atmosphere and lessening the corrosive effects of the sulfuric acid vapor to the system.

APTIC-23027

INDUSTRIAL MANGANESE POISONING.

For primary bibliographic entry see Field 07.
APTIC-23028

RECOVERY OF SULPHUR FROM ROASTER GASES.

(Assignee Not Given.) U. S. Pat. 1,734,991. 3p., Nov. 12, 1929. (Appl. May 6, 1927, 8 claims).
Raymond F. Bacon.

Identifiers: *By-product recovery, *S₂ removal (combustion products), *Reduction, Combustion gases, Sulfur compounds, Pressure.

A method of recovering sulfur from roaster gases is described wherein the sulfurous roaster gas is first compressed to a pressure of 4-5 atmospheres. The compressed gas is reduced by hot carbonaceous reducing agents continuously without the application of external heat; the heat is maintained by the reaction of the roaster gas and the reducing agents under pressure. Condensed elemental sulfur is recovered. The apparatus for the method includes a pressure pump in the line carrying the exhaust gases leaving the roasting furnace, and provision is made for carrying out the condensation and separation under the same pressure of 4-5 atmospheres in order to more thoroughly recover the sulfur.

APTIC-23029

PROCESS OF PREVENTING THE ESCAPE OF SULFUR DIOXIDE IN SMELTING SULFID ORES.

(Assignee Not Given.) U. S. Pat. 1,134,846. 5p., April 6, 1913. 3 refs. (Appl. June 30, 1913, 9 claims).
William A. Hall.

Identifiers: *Reduction, *Flame afterburners, *S₂ removal (combustion products), Copper, Stack gases, Furnaces, Primary metallurgical processing, By-product recovery, Design criteria, Iron compounds, Sulfur compounds, Sulfides.

A process is described for the recovery in elemental and commercial form of the sulfur evolved from pyrites in the operation of smelting copper, and for preventing the discharge of noxious sulfur dioxide fumes from the furnace into the atmosphere. A reducing gas flame is introduced into the upper level of the furnace, capable of reducing a part at least of the sulfur dioxide to elemental sulfur, while preventing the access of air to oxidize any considerable quantity of the elemental sulfur. The preferred temperature to be maintained may be about 700 C. Under certain conditions, such as the employment of a reducing gas poor in hydrogen, a certain amount of steam or water vapor is admitted along with the reducing gas.

APTIC-23032

TOYO KOGYO'S RESEARCH AND DEVELOPMENT ON MAJOR ROTARY ENGINE PROBLEMS.

Preprint, Society of Automotive Engineers, Inc., New York, 12p., 1970. 2 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 12-16, 1970, Paper 700079.)
Kenichi Yamamoto, and Takashi Kuroda.

Identifiers: *Rotary piston engines, *Engine design modification, Japan, Engine exhausts, Internal combustion engines, Automobiles, Engine operation modification, Design criteria, Hydrocarbons.

The structural features of the 10A engine, which is a prototype, 2 rotor engine designed for automotive use are reported. Among the studies carried out, particular attention was given to problems concerning cracking of the rotor housing, attributable to thermal fatigue. Measures taken to solve this problem are described. Other investigations were directed toward trial application of a die-cast rotor housing with thin chromium plating applied by the transplant coating process; measurements taken of flame propagation within the combustion chamber by using ion gap plugs; and reduction of Hydrocarbon emission by adoption of air injection with a thermal reactor. (Author abstract modified)

APTIC-23043

POLLUTION BY OXIDES OF SULFUR.

Chem. Engr. (London), 46 (7): CE261-CE262, Sept. 1968.
F. E. Ireland.

Identifiers: *Sulfur oxides control, Acid smuts, Stack gases, Fuels, Coal, Coke, Fuel oils, Oil burners, Chemical processing, Electric power production, Stacks, Scrubbers, Desulfurization of fuels, Alkaline additives, Sulfuric acid, Combustion.

Sulfur oxides arise from the combustion of sulfur-containing fuels such as coal, coke, and fuel oil; from sulfuric acid plants and miscellaneous uses of sulfur dioxide; and from the combustion of sulfur compounds in waste gases from manufacturing processes. Many investigations have been carried out on the removal of sulfur from fuel and on the removal of sulfur oxides from waste gases, but no generally practical methods have been developed. Thus, recourse is made to dispersion from suitably tall chimneys to reduce ground-level concentrations to acceptable limits. By controlling burner conditions to limit excess air in the gases, large users of fuel oil and electric power plants can reduce sulfur trioxide in waste gases from 40-50 ppm to about 5-10 ppm. In most countries, sulfuric acid is produced by contact processes that give a final acid emission to not more than two percent of the sulfur burned. Provided contact plants are equipped with adequate facilities for preheating, there should be no adverse local conditions produced by emissions. However, there is scope for research into acid mist formation and methods for its prevention at the source. Emissions from some chemical processes are often more concentrated than those from the combustion of fuel. It is common practice to remove the sulfur dioxide in these emissions by scrubbing with alkali solutions.

APTIC-23044

BRIGHT FUTURE FOR ARC CYCLE PLANTS

Can. Petrol., vol. 9:42-45, Jan. 1968.

Claude Salama, and Douglas V. Eyre.

Identifiers: *Natural gas, *Automatic methods, *Compression, Costs, Canada, Design criteria, Condensation, Heat transfer, Compressed gases.

Though the choice of a natural gas liquefaction process depends on economic factors, cascade cycles are usually mandatory for large capacity plants, such as those required for base-load operations. A cascade cycle transfers refrigeration at decreasing temperature levels by high-pressure condensation of one refrigerant followed by its vaporization at a lower pressure and hence lower temperature. In the standard cascade cycle, at least two and sometimes four stages of refrigeration are needed for each refrigerant fluid. Moreover, these cycles require costly piping systems as well as complex operational techniques. Simplified versions of the standard cascade cycle are represented by the dual refrigerant cycle and the auto-refrigerated cascade cycle (ARC). The former consists of a conventional propane cycle and an auxiliary cycle which

uses a binary mixture of ethane-methane. The composition of the auxiliary mixture is fixed so that it will readily condense by direct heat exchange with a propane refrigerant boiling at atmospheric pressure. The principle of the ARC is still one of refrigeration transfer from cooling water to decreasing temperature levels, but the refrigerant consists of a single mixture of nitrogen and hydrocarbons, the partial condensation at any one stage of which corresponds exactly to the refrigeration requirements of the next stage. The partial condensations of the refrigerant take place at any one pressure level corresponding to the high pressure of the cycle, while vaporization occurs at a single low pressure corresponding to the cycle compressor suction pressure. This system entails few mechanical engineering problems, reduces plant maintenance, and assures that the total amount of refrigeration is always available in different sections of the cascade. For a plant liquefying 300 MMscf, the cost of the ARC cycle is estimated to be over \$5,000,000 less than for the standard cascade.

APTIC-23047

TIME TO RETHINK SULFURIC SOURCES.

For primary bibliographic entry see Field 10.

APTIC-23048

SINGLE-PASS DRYER REDUCES AIR AND WATER POLLUTION.

Food Eng., 41 (12):83-85, Dec. 1969.

Frank L. Cross Jr., and Roger W. Ross.

Identifiers: *Citrus processing, *By-product recovery, *Drying, Stack gases, Food and feed operations, Solid waste disposal, Centrifugal separators.

When all of Florida's citrus processing plants are using normal amounts of fruit, 200-250 million pounds of waste material (peel, rag, and seeds) must be disposed of each week. A new single-pass dehydrator now makes it possible to convert this cannery waste into a molasses-like cattle feed that sells for \$18 or more per ton. Where the equipment is used, the wet peel goes to the bottom of the burner section of the furnace rather than directly through the flames, as in conventional feed mills. Because the first 28 ft of the dryer drum contain no lift baffles, the pressed peel comes to temperature uniformly without burning small particles on initial contact with the flame. The vapor, which includes steam from the peel, is then recirculated through the system. This allows a second pass through the heat to incinerate those fine particles that are not removed by centrifugal collectors. The steam contained in the vapor powers the evaporator where press liquor and other waste are concentrated. This evaporator also acts as a scrubber, further reducing particulate matter in the exhaust gases. The concentrated molasses is then returned to a press cake for recycling through the peel dehydrator. The dehydrator is expected to keep plant emissions within Florida's current emission standards.

APTIC-23050

THE DOYLE SCRUBBER.

Ind. Eng. Chem., 49 (12):57A-58A, 60A, 62A, Dec. 1957.

Harold Doyle, and Alan F. Brooks.

Identifiers: *Particulates, *Impingers, *Scrubbers, Canada, Stack gases, Costs, Dusts, Fumes, Mists, Chemical processing, Primary metallurgical processing, Particle size, Design criteria, Density.

Developed for metallurgical and chemical plants, the Doyle scrubber utilizes principles of wet-impingement collection at relatively high gas velocities with high recovery efficiency and low installation and maintenance costs. The installed cost per 10,000 cfm is 30.60 per cfm for steel units and \$1.00 per cfm for a rubber-lined steel unit. The gas stream with its suspended particulate matter or proportion of contaminant gas impinges at velocities of 130 feet per sec or higher into a liquid bath,

then undergoes a 180 deg change of direction within the bath. The velocity of impingement and the particle size and density of the gas stream contaminant establish the kinetic energy and the magnitude of the inertial forces tending to drive the particulate matter downward into the liquid. The cleaned gas leaves the impingement tank at the top and enters a spray eliminator section, which is usually an integral part of the scrubber. After removal of the spray or suspended liquid droplets of scrubbing medium, the gas stream can be exhausted or used in other processes. A summary of the performance of the scrubber on seven different industrial dusts, fumes, mists, or gases is presented in tabular form. The seven applications represent installations on which test and evaluation programs were carried out.

APTIC-23051

SULFURIC AS A UTILITY'S PROFITABLE BY-PRODUCT.

Chem. Week, 103 (6):51-52, Aug. 10, 1968.

Personal Author Not Recorded.

Identifiers: *By-product recovery, *Absorption (general), *Electrolysis, Costs, Stack gases, Electric power production, Control methods, SO₂ removal (combustion products), Sulfuric acid, Hydrogen, Oxygen.

A new electrolytic process has been developed to recover sulfur dioxide from power plant stack gases. The heart of the SO₂ removal and recovery operation is a membrane-type electrochemical cell that generates caustic soda, sodium acid sulfate, dilute sulfuric acid, oxygen and hydrogen from a solution of sodium sulfate. The dilute sulfuric acid and oxygen become supplemental feed streams for a nearby sulfuric acid plant; the hydrogen can be bottled in cylinders for local markets. The recovery system has built-in tankage on either side of the cell room that permits about 760 hr/yr of absorption without cell-room power. For instance, if the peak load occurs late in the day on Wednesday or Thursday, absorption of SO₂ can continue uninterrupted with the cells shut down. Then over the weekend, the cells could come on again and catch up, ready for normal operation on Monday morning. For a 1200-mw electric station burning 3.5%-sulfur coal, the investment cost of the process would be \$18.5. To remove 90% of the SO₂ from stacks, operating costs are set at \$2,972,000. During the first year of operation, income from the sale of 99% sulfuric acid (340,000 tons) should total \$5,810,000.

APTIC-23054

THE FUNCTIONING OF DEEP-BED FILTERS.

Trans. Inst. Chem. Engrs. (London), 46 (10):T283-T286, Dec. 1968. 8 refs.

K. J. Ives.

Identifiers: *Van der Waal's forces, *Particulates, *Filters, Great Britain.

A recent theory describing the removal of particles from a flowing suspension to the surface of filter grains in filter pores postulated that in a cell unit there is a distance, ao , extending from the grain surface within which all particles in suspension are impelled by van der Waal's forces to contact the grain surface. Within this concept, there is a volume proportional to Nao^3 (where N is the number of filter grains per unit bed volume) from which all particles will adhere to the filter grain surface. Changes in filtration action during the filtration cycle were attributed to changes in mean pore velocity and none to changes in relative adhesion volume. An analysis of the theory challenges these assumptions and concludes that the distance over which van der Waal's forces can act is always much smaller than the size of floc particles to be removed. Particles within this distance are unlikely to be removed and attraction forces come into equilibrium with their hydrodynamic drag. In a reply to the criticisms, the original authors further define the range over which van der Waal's forces can act and maintain that there is no direct relation between adhesion volume and the volume of

grains in a deep-bed filter composed of laminar unit cells.

APTIC-23055

PROCESSES FOR RECOVERING ELEMENTAL SULPHUR FROM SULPHUR GASES.

(Assignee not given.) Brit. Pat. 16,543. 9p., Dec. 27, 1916. (Appl. Nov. 23, 1915, 4 claims).

William Francis Lamoreaux.

Identifiers: *By-product recovery, *SO₂ removal (combustion products), *Reduction, Combustion gases, Coke, Sulfur compounds, Temperature.

In connection with the purification of sulfur dioxide-containing gases wherein the gas is passed through a bed of incandescent coke, known processes do not effect the reduction of sulfur dioxide to sulfur in one operation. Either the gas is passed repeatedly over the coke, and the sulfur formed is condensed each time; or the product obtained by passage through the coke is passed to a brickwork chamber for decomposing sulfur compounds with carbon, hydrogen, or oxygen. In both instances, special heating techniques are required to compensate for loss of heat due to endothermic reactions. The present invention makes it possible to recover sulfur in one step, while effecting a material economy of heat. The necessary heat increment for substantial reduction is obtained by heating the gas before it is brought into contact with the incandescent carbon. A portion of this heat is derived by heat interchange from outflowing highly heated gases carrying the reduced sulfur. The process is a continuous one and separation of elemental sulfur from its gaseous compounds is rapidly and completely effected. At 1300 C, a 98% reduction of sulfur dioxide is obtained.

APTIC-23060

UNA-SPRAY BURNER—AN ADVANCED BURNER FOR EXTERNAL COMBUSTION ENGINES.

Preprint, Society of American Engineers, Inc., New York, 8p., 1970. 1 ref. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan 12-16, 1970, Paper 700117.)

R. E. Bedford.

Identifiers: *Afterburners, *Aerosol generators, *Combustion, Engine exhausts, Combustion gases, Power sources, Excess air, Carbon monoxide, Nitrogen oxides.

An advanced, multiple-fuel burner concept is presented, and the current development status of the burner is summarized. The unique feature of the burner is the use of a new technique of fuel atomization that provides significant performance advantages in terms of efficiency and pollutant emission. Emissions at 30% excess air of smoke, carbon monoxide, and oxides of nitrogen are about 10% that of a standard burner. Future application of the burner to external combustion engines is discussed. (Author abstract modified)

APTIC-23061

USE OF FILTERS WITH FF FILTER MATERIAL FOR HYPERFINE PURIFICATION OF GASES (AIR).

(Isopol'zovaniye filtrov s fil'truyushchim materialom FP). Text in Russian. Tsvetn. Metal., 40 (4):44-47, 1967. 8 refs.

R. A. Burovoy, and P. I. Basmanov.

Identifiers: *Dusts, *Filters, USSR, Aerosols, Operating variables, Primary metallurgical processing, Operating variables.

FP (Petryanov) filters are widely used in the Soviet Union, especially in the nonferrous metallurgy industry, to remove harmful dusts from the atmosphere. Available grades of these ultrafine fibers have standard air flow resistances of 1.5, 4, and 6 mm H₂O. A table of available filter models utilizing these materials is presented; their maximum capacities range from 10 to 4950 cu m/h with corresponding surface areas of 0.1 to 33.0 sq m. Under optimum conditions these filters are effective

for about 4-5 thousand hours, and in certain cases as long as 7-8 thousand hours. Maximum operating temperatures for the various filters are 40, 60, and 90 C.

APTIC-23062

THE ECONOMIC COMBUSTION OF SULFUR-CONTAINING HEATING OIL. PART II—AN ACCOUNTING OF THE OPERATING EXPERIENCES WITH 1.0 PER CENT EXCESS AIR.

Combustion, 34 (9): 25-32, March 1963. (Presented at the VGB (Ver. Grosskesselbesitzer), 'Oil Furnaces' Meeting, Lingen, Germany, April 12, 1961; printed in Mitt. Ver Grosskesselbesitzer, no. 73, Aug. 1961.)

F. Glaubitz.

Identifiers: *Boilers, *Excess air, *Sulfur oxides control, Corrosion, Germany, Stack gases, Fuel oils.

A combustion process which employs a very low excess air and flue gas oxygen content is described to control corrosion. The use of sulfur-containing fuel can lead to corrosion by sulfuric acid because of the relationship between dew point, oxygen content, and sulfur content of the fuel. Experimental measurements carried out on boilers indicate the optimum quantities of various combustion parameters in terms of economics, deposits, and continuous operation time. Development of the optimum system is described, and detailed discussions of various problems encountered with different types of boiler arrangements are discussed. Results of firing experiments with superheating are tabulated.

APTIC-23063

ROASTING OF ZINC CONCENTRATE IN A BOILING LAYER WITH HIGH CONCENTRATIONS IN THE GASEOUS PHASE.

(Obzhig tsinkovogo konsentraty v kipiyashchem sloye pri vysokikh konsentratsiyakh SO₂ b gazovoy faze). Text in Russian. Tsvetn. Metal., 40 (2):21-24, 1967. 7 refs.

A. P. Snurnikov, V. F. Larin, Ye. V. Margulis, and S. M. Krasavina.

Identifiers: *Calcination, *Zinc compounds, USSR, Sulfur dioxide, Oxygen, Temperature, By-product recovery.

Experimental roasting of zinc concentrate at 600-900 C in a boiling-layer reactor is reported. Analyses of the calcination are tabulated for various roasting conditions. (Sulfur dioxide to oxygen ratio of 90:10 to 50:50; roasting time 25-300 min). The following optimum conditions were established: 900 C; 66% SO₂, 33% O₂; for not more than 1 hour. It is concluded that roasting with technical grade oxygen and recirculated SO₂ cannot yield a calcine suitable for conventional methods of zinc recovery.

APTIC-23066

FOUR YEARS OF DIESEL ODOR AND SMOKE CONTROL TECHNOLOGY EVALUATIONS—A SUMMARY.

Preprint, American Society of Mechanical Engineers, New York, 16p., 1969. 7 refs.

(Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, Los Angeles, Calif., Nov. 16-20, 1969, Paper 69-WA/APC-3.)

Karl J. Springer, and Charles T. Hare.

Identifiers: *Smokes, *Diesel engines, *Automotive emission control, *Odor counteraction, Automotive emissions, Odors, Catalytic afterburners, Electrostatic precipitators, Carburetion, Timed fuel injection, Fuel additives, Maintenance, Engine design modification.

Methods to control smoke and odors from diesel engines are considered. The reduction of smoke from new engines may be affected by engine design, fueling, and combustion alterations. Maintaining the reduced levels will depend on maintenance, driver, and fleet practices. Effective control of diesel odor continues to be elusive,

although a few approaches such as catalytic mufflers and improved fuel injection for one type of engine have demonstrated merit. Much remains to be done in both smoke and odor areas of diesel emission control technology to identify new control methods and to investigate their performance and cost-effectiveness relationships. Evaluation and measurement techniques are described for the various control mechanism tests. (Author abstract modified)
APTIC-23067

REMOVAL OF SULFUR FROM COPPER-SULFUR PLANT WASTE GASES BY THE AFTER-BURNING METHOD.

(Ochistka otkhodnykh gazov mednosernykh zavodov ot sery metodom doziganaya). Text in Russian. Khim. Prom. (Moscow), no. 4:51-58, 1962, 7 refs.

T. D. Averbukh, I. A. Apakhov, O. V. Maydurova, N. P. Bakina, and N. P. Blinova.

Identifiers: "Catalytic afterburners, *S₂O removal (combustion products), Ussr, Stack gases, Pilot plants, Sulfuric acid, Aluminum compounds, Barium compounds, Vanadium compounds, Nitrates, Aluminum oxides, Carbon disulfide, Hydrogen sulfide, Catalysts, Flow rates, Temperature.

Catalytic afterburning of waste gases containing about 3 vol. % carbon disulfide, carbon sulfide, hydrogen sulfide, and sulfur dioxide (50 g/cu m of sulfur) to produce sulfuric acid was studied experimentally at temperatures of 200-600 C using 16 different catalysts. Data are given for the following catalysts: various types of bauxite, barium-aluminum-vanadium (BAV), and chamotte treated with nickel and aluminum nitrates. Pilot studies made at flow rates of 800-1200 cu m/h using bauxite and BAV catalysts are reported, and a proposed production installation is described.
APTIC-23070

FUNDAMENTAL STUDY OF SULFUR FIXATION BY LIME AND MAGNESIA. (FINAL REPORT.)

Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Contract PH 86-66-108, 55p., June 30, 1966, 23 refs. CFSTI: PB 176843

J. J. Ward, D. A. Pettit, J. F. Walings, R. H. Cherry Jr., and A. Levy.

Identifiers: "Stack gases, *Alkaline additives, Limestone, Boilers, Furnaces, Calcium sulfates, Magnesium compounds, Sulfates, Reaction kinetics, Thermodynamics.

The basic factors involved in the capture of sulfur dioxide by limestone or dolomite addition into the hot stack gases of a boiler furnace are identified. The limiting conditions under which lime and magnesia will react with SO₂ to form calcium and magnesium sulfates are defined. The three tasks involved in the study are thermodynamic calculations to show the course of the probable chemical reactions, determining kinetic factors as far as they can be without experimentation, and making recommendations for the use of limestone and dolomite most effectively in large boiler furnaces. Theoretical calculations indicate that calcium oxide or magnesium oxide is capable, at equilibrium, of removing all but 1 ppm of SO₂ at a specified temperature. Large amounts of limestone or dolomite are necessary to remove SO₂ flue gases. Temperature and other critical operating parameters are discussed.
APTIC-23073

SO₂ PRESSURE OVER A SOLUTION OF MAGNESIUM BISULFITE-BISULFITE-SULFATE.

(Davleniye SO₂ nad rastvorom sul'fit-bisul'fita magniya). Text in Russian. Zh. Prikl. Khim., vol. 36:2116-2121, 1963, 3 refs.

V. A. Pinyav. Identifiers: "SO₂ removal (combustion products), *Magnesium compounds, Ussr, Combustion gases, Sulfates, Sulfites, Pressure, Temperature.

Sulfur dioxide pressure over a solution of magnesium bisulfite sulfate saturated with magnesium sulfite was determined experimentally over the range 30-60 C; plots of SO₂ pressure as a function of total SO₂ concentration in solution are presented. Sulfur dioxide removal by the magnesite method is feasible using magnesium sulfite-bisulfite-sulfate solutions with an SO₂/Mg molar ratio not exceeding 1.5-1.6 with MgSO₄ greater than 120 g/l, or 1.6-1.7 with MgSO₄ less than 120 g/l.
APTIC-23085

IMPROVEMENTS IN OR RELATION TO THE REDUCTION OF SULPHUR DIOXIDE.

(Assignee not given.) Brit. Pat. 29,030, 4p., May 22, 1913. (Appl. Dec. 17, 1912, 2 claims).

Marcus Ruthenburg.

Identifiers: "SO₂ removal (combustion products), *Reduction, Great Britain, Stack gases, Coke, Primary metallurgical processing, Design criteria.

Sulfur dioxide in smelter and other industrial gases can be treated by passing the gases through a heated column of coke or other carbonaceous material, the resulting products through a condensation chamber, then washing the products to extract the remaining traces of sulfur dioxide. The present invention provides for the continuous operation of such a process. To this end, the column of coke or other carbonaceous material is heated electrically so that it can be maintained at the temperature required for the reaction to take place. The heating is effected by current passing from an upper to a lower electrode. The process can be carried out without admission of air and the consequent loss of the carbonaceous material by combustion. In some processes, the carbon is blasted with air to raise the temperature; when this is accomplished, the air is cut off and the sulfur dioxide passed through until the temperature falls below the reaction point. At this stage, the sulfur dioxide is shut off and air admitted again to raise the temperature of the coke.
APTIC-23090

PREPARATION AND FIRING OF EMULSIONS OF NO. 2 FUEL OIL AND WATER. (SUMMARY REPORT.)

Battelle Memorial Inst., Columbus, Ohio, Thermal Systems Div., NAFCA Contract PH 86-68-84, Task Order 8, 36p., Nov. 1, 1968, 28 refs. CFSTI: PB 189075

R. E. Barrett, J. W. Moody, and D. W. Locklin.

Identifiers: "Distillate oils, *Domestic heating, *Firing methods, *Emulsions, Smokes, Furnaces, Oil burners, Particle size, Fuel additives, Process modification, Excess air, Oxygen, Combustion, Flow rates, Water, Surfactants.

As a part of a program evaluating methods of reducing air pollution emissions from combustion devices including domestic oil burners for space heating, tests are being conducted in a furnace which utilizes a 1-gph high-pressure atomizing burner firing commercial No. 2 fuel oil. These tests will determine the extent to which air pollutants can be reduced by using various fuel additives in domestic-size oil-heating units. In the desired type of oil-water emulsion, each fuel oil droplet contains one or more small droplets of water. As the emulsion is sprayed into the combustion chamber, the water within the fuel droplet vaporizes before the fuel is consumed. The pressure generated within the fuel droplet by the vaporizing water is sufficient to rupture the fuel droplet in a miniature explosion. This shattering or secondary atomization of the fuel droplet causes further reduction in the fuel droplet size and exposes a greater surface area of fuel for vaporization, mixing and burning, thus providing more rapid and improved combustion. The results of a task to develop techniques for preparing emulsions containing up to 50% water in distillate fuel oil are reported and a technique for firing the emulsions in the experimental rig is developed. Relatively stable emulsions containing 5 to 53% water were produced in

quantities of 1/2 to 2 gallons from commercial No. 2 fuel oil, distilled water, and commercial emulsifying agents. Satisfactory firing of these emulsions was accomplished in a laboratory combustion chamber with a burner identical to the burner used in previous tests. Stable water-in-oil emulsions were prepared. The emulsions were prepared by dissolving the surfactant in commercial No. 2 fuel oil. Deionized water was added in one step and the mixture was stirred for two minutes in a Waring blender. At higher water contents, the procedures produced oil-in-water emulsions. Droplet size measurements were made on sprays of water-in-oil emulsions containing up to 53% water by weight. The amount of water added had little effect on droplet size. Emulsions containing up to 53% water were fired in a furnace similar to the test furnace. Combustion appeared generally as good as when firing commercial fuel oil, although a perceptible change in the flame was observed when switching from firing emulsions on to firing fuel oil. Combustion measurements were made on emulsions containing up to 29% water. The relationship of smoke and oxygen in the flue gas did not show any significant difference when firing fuel oil and emulsions at 1.0 gph. When firing at 1.25 gph, emulsified fuels required greater excess air to reduce smoke to acceptable values.
APTIC-23092

IMPROVEMENTS IN AND RELATING TO THE SEPARATION OF SULPHUR FROM SULPHURETTED HYDROGEN AND GASES CONTAINING THE SAME.

(Assignee not given.) Brit. Pat. 25,454, 6p., Nov. 15, 1912. (Appl. Nov. 15, 1911, 6 claims).

Paul Fritzsche.

Identifiers: "By-product recovery, *Aluminum compounds, *Hydrogen sulfide, Germany, Inorganic acids, Sulfur compounds, Sulfates, Decomposition.

An improvement in the process of obtaining sulfur from the reaction between sulfurous acid and sulfuretted hydrogen is presented. The main feature of the invention is that the two gases are treated simultaneously or in succession by a liquid in which aluminum hydrate or a similar compound, i.e., basic aluminum sulfite, is contained in suspension or solution. The sulfurous acid gas is partly absorbed by the liquid with considerable evolution of heat and the suspended aluminum precipitates pass into solution. Acid aluminum salts are formed which contain more sulfurous acid than that corresponding to the composition Al₂(SO₃)₂ and which are stable only in aqueous solution. These solutions react on sulfuretted hydrogen in the same manner as aqueous solutions of sulfurous acid, but have a much lower vapor tension than the latter. They must be heated to 60 C to give off sulfurous acid. This yields a white precipitate of basic sulfite of alumina which is insoluble in water, but on addition of sulfur acid again passes into solution; acid salt is formed. The same white precipitate of basic aluminum sulfite is formed when sulfurous acid is removed from the solution of the acid salt by the action of sulfuretted hydrogen, with simultaneous precipitation of sulfur. The amount of sulfur precipitated does not correspond to that of the sulfurous acid which has disappeared from the solution, since pentathionic acid is also formed. If, however, the solution is treated with excess of sulfuretted hydrogen, the pentathionic acid again decomposes and the amount of sulfur obtained corresponds to the amount of sulfurous acid decomposed.
APTIC-23094

KRAFT PULP MILL ODORS AND THEIR COUNTERMEASURES. PART II.

(Kurafuto parupukojio no akushu to sono taisaku. sono ni). Text in Japanese. Akushu no Kenkyu (J. of Odor Control), 1(2):35-42, June 20, 1970, 14 refs.

Yoshihiro Shigeta.

Identifiers: "Odors, *Kraft pulping, *Odor counteraction, Japan, Solvents, Boilers, Digesters,

Paper manufacturing, Scrubbers, Black liquor oxidation, Process modification, Sulfur compounds, Hydrogen sulfide, Pyrolysis, Combustion, Steam, Temperature.

The odors from kraft pulp mills originate in the cooking, evaporation, and recovery processes which are all more or less related to the use of chemical solvents and agents. Odors produced through chip cooking depend on the types of woods, cooking temperature and time, and on the concentrations of sulfur compounds. The control of steam containing gas emission from the digester and the blow tank is the first effective countermeasure. In a batch type unit, odor emission can be reduced when steam thus lowering the blow gas and the waste gas temperatures down to exchanger thus lowering the blow gas and the waste gas temperatures down to below 60 C. Another feasible means of removing odor in a cooking process is the chlorine water contact and combustion method where the waste gas temperature is lowered to about 50 C by washing then preheated to between 80 C and 90 C for drying and finally burnt at 700 C for 0.8 second in a heavy oil burner. Oxidization of kraft black liquor is recommended for the removal of odor in the evaporation process. Kraft black liquor collected in solvent recovery boilers can be changed by pyrolysis into sulfur compounds most of which are combustible. It is noted that these odor removal techniques have to be applied very carefully in terms of boiler operation less excessive loads in a recovery boiler should result in the increase in H₂S generation.

APTIC-23117

WATER BALANCE, AIR POLLUTION CONTROL AND WASTE DISPOSAL.

(Wasserwirtschaft, Luftreinhaltung und Abfallbeseitigung). Text in German. Wasser Luft Betrieb, 14 (7):290-292, July 1970.

Personal Author Not Recorded.

Identifiers: *Incineration, *Solid waste disposal, *Water pollution, Abatement, Advisory services, Federal governments, Regional governments, Area emission allocations, Maximum allowable concentration, Germany, Industrial emission sources, Sludge, Composting, Dumps.

Recommendations of the Advisory Council for Environmental Planning concerning air and water pollution and waste disposal analyze the consequences of pollution on the environment, stipulate maximum permissible levels of the various pollutants, and estimate the quantities of industrial waste, of household waste, and of clearing sludge which have to be disposed of in communities of various sizes. The installation of an incinerator pays only if it services at least 100,000 inhabitants otherwise its capacity remains unused. Smaller communities therefore must dump their waste in regional dumps but the constant operation of a bulldozer which is necessary is economical only for dumps servicing at least 15,000 inhabitants. To prevent contamination of ground water through waste deposits, an impermeable layer at least 1 m thick must separate the two zones. Of decisive importance is the correct choice of the site for dumps, orderly and controlled dumping, the proper utilization of qualitatively harmless clearing sludge compost, and suitable dumping site selection for especially objectionable materials like used oil, chemical, and radioactive waste. To the degree that waste can be composted this should be done together with the clearing sludge because such compost is better suited for use in agriculture. Superregional solutions must be found for the disposal of abandoned cars. Regional planning must provide for the selection of dumping grounds.

APTIC-23126

HOW HIGH ARE THE COSTS OF AIR POLLUTION CONTROL?

(Wie teuer ist die Luftreinhaltung?) Text in German. Wasser Luft Betrieb, 14 (7):286-289, July 1970. 2 refs.

Rudolf Schwanecke.

Identifiers: *Costs, *Control methods, *By-product recovery, *Control equipment, Asphalt, Concrete, Germany, Dusts, Industrial emission sources, Chemical processing, Mineral processing, Petroleum production, Centrifugal separators, Electrostatic precipitators, Olefins, Acetylenes.

Examples of the cost of air pollution are cited. A plant producing bituminous highway surfacing material emits 100 g/N cu m dust. To produce a ton of surfacing material approximately 300 N cu m hot combustion gases are generated. A medium-sized plant with an hourly output of 50 t/h and a waste quality of 25,000 N cu m/h emits 2500 kg dust per h. The investment in a good dust-arrester installation of 99.9% efficiency consisting of a battery of cyclones as preliminary separators and a high-efficiency dust arrester comes to about \$2,000 DM for the whole plant. The dust is reclaimed almost completely in a dry state. It can be returned into the production cycle and replace ground limestone as a filler. On this basis, the pollution control installation will pay for itself in 1 1/2 years. Similar calculations are presented for examples involving the cost of control installations in a chemical plant manufacturing toxic compounds, in the manufacturing of cement and in the petrochemical industry (olefins or acetylene production). In all cases the value of the reclaimed materials or the saving in the cost of high stacks for example which would be necessary if no pollution control equipment existed more than make up for the initial investment in pollution equipment.

APTIC-23127

COMPACT-TYPE SEPARATORS FOR USE IN MEDIUM AND SMALL SIZE INDUSTRIAL PLANTS.

(Kompakt-Abscheider zum Einsatz in mittleren und kleineren Industriebetrieben). Text in German. Wasser Luft Betrieb, 14 (8):326-329, August 1970.

Identifiers: *Industrial emission sources, *Electrostatic precipitators, *Filters, Germany, Dusts, Mists, Fuel oils, Primary metallurgical processing, Operating variables, Vapor recovery systems, Design criteria, Emulsions.

The trend is away from central dust control installations and towards decentralization; increasingly compact dust separators are moved next to the dust generating machines which has the advantage of short ducts, easy installation, small component parts and easy adaptation to production changes. Compact separators contain the separation elements and the blower assembly in a single housing and most are so constructed that their capacity can be added to at a later date. Because of various considerations neither centrifugal nor wet but only filtering or electrostatic separators are used. One of a number of small separators described with a capacity of 2200-2500 cu m/h does not require more than 0.75 sq m floor space and operates with a 2.2 kW motor. Oil mist is generated wherever high speed machines require oil or emulsions. Various oil separators are built, some mounted directly on machines which return the oil to the machine, others draw off the air, filter it, and recirculate it. Oil mist concentrations exceeding 150 mg/N cu m require prefiltering equipment. Other oil separators work on the principle of electrostatic separators, they are also used for the separation of other small suspended particles in welding shops, in die casting establishments and in similar industrial applications.

APTIC-23128

THE USES AND LIMITATIONS OF TREND SURFACE ANALYSIS IN STUDIES OF URBAN AIR POLLUTION.

Atmos. Environ., 4 (2):129-147, 1970. 34 refs.

Patricia M. Anderson.

Identifiers: *Mapping, *Diffusion models, *Sulfur dioxide, *Smokes, Great Britain, Urban areas, Winds.

Trend surface mapping, a technique of areal regression, was applied to 24-hr observations of smoke and sulfur dioxide to demonstrate its possible use in two aspects of urban air pollution studies: the mapping of patterns of pollution concentrations, including patterns of drift of pollution; and the use of residual values for modifying concentrations predicted by diffusion models that lack factors operating at the local scale. Of the two possible applications, only that of generalizing pollution patterns, seems to have any merit. For mapping pollution patterns, trend surface analysis provides a means of demonstrating a trend in a distribution, even when this is very small. If concentrations are expressed as percentage of some mean value to allow spatial considerations, the trend patterns produced indicate the extent of pollution drift within the urban area. From the small number of cases analyzed, a very generalized model of pollution drift is suggested in which both smoke and sulfur dioxide concentrations show their greatest relative downwind increase when winds are lightest.

APTIC-23131

DUST ARRESTOR PERFORMANCE AND DUST HANDLING IN COKE DRY-COOLING PLANT.

Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 1:20-21, 1970.

D. D. Vorobev, A. P. Sergeev, V. G. Balanov, R. I. Davidzon, and V. L. Vodolazhchenko.

Identifiers: *Dusts, *Collectors, *Coke-oven gas, Materials deterioration, USSR, Coke, Baffles, Centrifugal separators, Settling chambers, Fans (blowers).

At a coke dry-cooling plant in the Soviet Union, dust is removed from circulating gas to a dust-settling hopper before the gas stream enters the waste heat boiler and again in cyclones before it enters the exhaust fan. By fitting the hopper with high-strength chamotte baffles, the average dust content of the gas entering the cyclones was reduced to 3-4 g/cu m compared to 4-6 g/cu m when the baffles were supported by welded steel girders faced with guniting material. Erosion of the cyclones was checked by lining internal surfaces of all conical sections with cast stone slabs. Coke breeze and dust from the hoppers and cyclones is discharged through a sludge pipeline to a settling tank on a quenching tower. Blockage of the pipe was reduced by increasing its angle of inclination and the addition of more wash down nozzles along its length.

APTIC-23136

RECLAIMING SOLVENTS FROM VAPOURS AND LIQUIDS.

Mater. Reclamation Weekly, 116 (19):34-35, May 9, 1970.

Personal Author Not Recorded.

Identifiers: *Solvents, *Adsorption, Carbon black, Liquids, Vapors.

An activated carbon system is described that achieves up to 99% reclamation of industrial solvents from air or gas mixtures. In addition, the system efficiently extracts and reclaims solvents and organic compounds from water and other liquid mixtures. Air laden with solvent vapor is drawn into the carbon plant through ducting, then filtered and cooled or heated before passing to a static or rotary bed adsorber containing activated charcoal. When the carbon bed has adsorbed the designed charge of solvent, the vapor/air stream is switched to a second adsorber, and steam at low pressure is fed to the charged adsorber which causes the carbon to release, in vapor form, the solvent which it adsorbed. The steam/solvent vapor mixture is then condensed and the solvent recovered. Liquid-phase adsorption uses active carbon for the adsorption of small amounts of water-miscible solvents from solutions with water. The system is claimed to increase substantially the concentration of a weak solvent/water solution.

APTIC-23139

THE RESEARCH AND DEVELOPMENT OF AIR POLLUTION CONTROL TECHNOLOGY IN THE UNITED STATES. PART I.

(America at chura taidi oven boudi no gijinsu no kinsyu kishiten. I). Text in Japanese. Sangyo Kagaku (Ind. Public Notices), 6 (5):283-287, May 23, 1970.

Tsuyoshi Yamada.

Identifiers: *Steam plants, *SO₂ removal (combustion products), Mineral products, Japan, Combustion gases, Scrubbers, Ammonium compounds, Heat transfer.

The process for removing sulfur dioxide developed by Combustion Eng. Inc., consists of the addition of dolomite and the four mechanical stages: heat exchanger, scrubber, another heat exchanger, and a stack gas tower, respectively. The heat exchanger is for cooling the stack gas as well as for reheating treated gas. A glass marble bed about 75 mm deep is installed in the scrubber where sulfur dioxide is absorbed and stack gas is removed. The difficulty with this process is that absorbents such as CaO which fly in from the furnace are easily accumulated around the entrance to and exit from the scrubber. Repeated experiments revealed that the nonconstant velocity of the gas streaming into the scrubber is responsible. The marble bed also becomes clogged after several days of operation, resulting in the active formation of deposits in the diameter and the reheater. The unbalanced distribution of gas in the marble bed is the cause of such deposits. TVA has been conducting various experiments for a long time to remove sulfur dioxide, and some of them can be listed as follows: the absorption process by active carbon, the conversion of sulfur dioxide into sulfuric acid by using manganese dioxide as a catalyst, the production of high-concentration sulfur dioxide, and absorption by an ammonium salt solution. The process utilizing potassium phosphate possesses a great power to absorb sulfur dioxide.

APTIC-23146

EFFECTS OF IODINE CONCENTRATION ON THE EFFICIENCY OF ACTIVATED CHARCOAL ADSORBERS.

Health Phys., 19 (2):223-233, Aug. 1970, 13 refs.

Douglas K. Craig, H. W. W. Adrian, and D. J. J. C. Bower.

Identifiers: *Carbon black, *Reactors (nuclear), *Filters, *Iodine, Africa, Adsorption, Vapors.

When the activated charcoal adsorbers used to remove halogen vapors from a nuclear reactor's gaseous effluents were found to have efficiencies far below 99%, 16 individual filter units were tested for their ability to recover iodine vapor labeled with iodine-131. Only 6 of 74 results exceeded 99% and efficiency appeared to decrease sharply as upstream iodine concentration decreased. Therefore, intensive tests with upstream iodine concentrations of 0.3-300 micrograms I₂/cu m air were conducted on one unit only. Within the range of variables tested, only the concentration seemed to affect the decontamination factor. Further tests involving attempts to desorb methyl iodide either before or after the adsorber unit have failed. Tests generating methyl iodide in concentrations from 0.1 to 2000 micrograms/cu m showed that the efficiency of both impregnated and unimpregnated adsorbers was independent of concentration. Tests conducted on 12 new KI-impregnated adsorbers displayed the same concentration dependence as the noniodized units. The implications of this result are discussed in relation to adsorber testing and the iodine concentrations that are likely to follow an accidental iodine release.

APTIC-23161

SELECTING DUST COLLECTORS.

Chem. Eng. Progr., 64 (1):60-64, Jan. 1968.

J. L. Smith, and H. A. Saeil.

Identifiers: *Dusts, *Electrostatic precipitators, *Bag filters, *Venturi scrubbers, Costs, Fertilizer manufacturing, Operating variables, Pilot plants, Filters, Scrubbers, Phosphates.

The removal of undesirable organics and phosphates from the phosphate rock used in the production of phosphoric acid is usually accomplished in a multistage fluid-bed reactor equipped with cyclone collectors for entrained dust particles. The dust passing through the collectors is then subjected to wet scrubbing. However, even with a reasonably efficient wet collector, enough fine particles escape so that an objectionable plume is produced as gases exit to the atmosphere. With the goal of obtaining a 99% collection efficiency, comparative pilot-plant studies were undertaken of venturi scrubbers, fabric baghouses, and electrostatic precipitators. The highest efficiency (99.9%) was exhibited by the electrostatic precipitator, which, despite higher installation and purchase costs, also proved to be least expensive to operate over a 10-yr period. The cost of an electrostatic precipitator for 10 yrs is estimated at \$254,000 as against \$269,090 for the baghouse and \$325,000 for the wet scrubber. Since its installation, the efficiency of the precipitator has been raised even more by changes in the quench water control system and the dust withdrawal system.

PARTICLE FILTER.

(Atomic Energy Commission, Washington, D. C.) U.S. Pat. 3,252,271, 4p., May 24, 1966, 5 refs. (Appl. April 3, 1964, 2 claims).

Lorraine F. Hatch, James J. Reilly, and Stephen J. Wachel.

Identifiers: *Fluidized bed reactor, *Particulates, *Membrane filters, Nickel, Design criteria.

As apparatus and process are described in which particulate solids are fluidized in a vessel by a gaseous medium to prevent fines from the system from contaminating the reaction products, and to greatly improve the efficiency of fluidized bed processes and reactors. The apparatus has at least two separate porous-membrane covered gas outlets, one of which has a porous membrane-covered orifice running around the side walls of the reactor vessel in a specified position. The membranes are made of nickel. Gas is introduced into the reactor vessel according to operating instructions. The bed is fluidized and allowed to expand to the required position, after which the gas is removed from the vessel. The disc shaped static bed thus formed provides an excellent filter for the system while permitting fluidization of the remainder of the bed to continue. The filtering action can easily be renewed without interrupting fluidization merely by controlling the pressure drop of the system as specified. Conventional means i.e., by the syphon, can be employed for removing fines from the reactor vessel.

APTIC-23175

CENSUS OF FEDERAL COAL RESEARCH GIVEN AT SALT LAKE CITY MEETING.

Mining Engineering, 15 (11):51-55, Nov. 1963.

Robert M. Jameson.

Identifiers: *Research programs, *Coal, Federal government, Dusts, Boilers, Magnetohydrodynamics (mhd), Electrostatic precipitators, Gasification (synthesis), Catalysis, Hydrogenation.

About 50% of coal consumption in the United States is in the production of electric power, 20% in the production of metallurgical coke, and over 20% in the production of process steam and power. The U. S. Bureau of Mines' Division of Coal Research places much emphasis on research that will maintain coal's leadership in these established areas. This emphasis is reflected in the following projects now underway: the possible utilization of a coal-fired turbine in conjunction with conventional boilers; the removal of dust from coal-generated gas by an electrostatic precipitator operating at turbine conditions; conversion of coal and coal gases in plasma; conversion of coal to high-Btu gas by direct hydrogenation and catalytic methanation; the application of nuclear process heat to the gasification of coal; purification of synthesis gas for high-Btu pipeline gas;

four types of reactor systems for catalytic hydrogenation of carbon monoxide; magnetohydrodynamic generation of power from controlled carbonization processes for the production of char from coal; and the use of coal as a supplemental fuel for blast furnaces. The current status of these projects is outlined.

APTIC-23176

ABSORPTION OF SULFUR DIOXIDE IN THE FOAM REGIME.

(Pogloshcheniye dvukhlini vory pri penezhenii rezhime). Text in Russian. Izv. Vysshikh Uchebn. Zavedenii Khim. i Khim. Tekhnol., no. 3:489-493, 1960, 9 refs.

M. Ye. Pozin, B. A. Kopylov, E. Ya. Tarai, and S. G. Karbanov.

Identifiers: *Absorption (general), User, Combustion gases, Scrubbers, Calcium compounds, Sodium carbonate, Oxides, Flow rates.

Sulfur dioxide removal in a foam absorber at gas flow velocities (w) of 0.5-2.5 m/sec and absorbent flow rates (l) of 1-5 cu m/m-h was studied experimentally for a number of absorbing agents (water, calcium oxide suspensions, and sodium carbonate solutions). Absorption by this method was more effective than for packed columns operating in a film regime. The degree of absorption on a single tray decreased from 66 to 36% as initial SO₂ concentration increased from 0.8 to 8% (w equals 1 m/s, l equals 5 cu m/s). This is linked with a decrease in absorption coefficient from 32-33 to 7 kg/sq m-h-mm Hg. Use of an alkaline absorbent gave a (2-2.5)-fold increase in the degree of absorption over that for water alone. Absorption coefficients for absorbent flow rates of 1-5 cu m/m-h ranged as follows (kg/sq m-h-mm Hg): 5-9 for water, 14-19 for milk of lime, and 15-23 for 0.5N sodium carbonate solution.

APTIC-23177

INVESTIGATION OF THE CASCADE METHOD OF COMPRESSING METHANE.

(Issledovaniye kaskadnogo metoda szhizhaniya metana). Text in Russian. Tr. Inst. Ispol'z Gaza, Akad. Nauk Ukr. SSR, no. 9:51-55, 1960.

A. G. Cherlikov.

Identifiers: *Methanes, *Compression, *Compressed gases, USSR, Natural gas, Supercooling.

Three-cascade compression of methane using propane, ethylene, and methane as cooling agents was analyzed in two variants: one using cold from the return flow of the cooling agent in the third stage in the heat exchanger of the same stage, the other using this cold to supercool the cooling agent in all the stages (third-stage pressure of 20-70 atm in both cases). Energy consumption peaked sharply when the methane is compressed at about 47 atm, and optimum final temperature for the compressed methane was established in the vicinity of -105 C (methane coolant). An energy consumption of 0.29 kWh/kg is established. Calculations were verified with laboratory tests using gas containing 98% methane. The cascade method is recommended for large-scale compression of natural gas.

APTIC-23179

ATMOSPHERIC POLLUTION CONTROL.

Chem. Eng. Progr., 55 (7):49-53, July 1959. (Presented at the American Institute of Chemical Engineers Meeting, Salt Lake City, Utah, Sept. 1958.)

W. T. Purvance.

Identifiers: *Primary metallurgical processing, *Control equipment, *Alkaline additives, *Fluorides, Costs, Steel, Limestone, Stack gases, Open hearth furnaces, Sintering, Collectors, Centrifugal separators, Electrostatic precipitators.

The development of measures to control fluoride emissions from a Utah steel plant which had caused damage to local animals is described in detail. The open hearth shop and sintering plant

were the major sources of emission, while the locally-mined iron ore was the raw material responsible for the greatest quantity of fluorine. On the basis of extensive pilot plant testing, limestone was added to the sintering mix, and equipment for cleaning sintering waste gases were installed, including facilities for injecting pulverized limestone into the gas stream, a battery of mechanical cyclones, and an electrostatic precipitator. A reduction of 96% in fluoride emissions from this source was thus achieved, with important savings from recycling the waste gas. For the open hearth operations, it was decided to collect and blend the waste gas effluent from all the furnaces in a collector main flue, from where it is passed to individual precipitator units. Clean gases are discharged into existing stacks; hydrated lime is the reactant in the process. The major problems encountered were handling of the collected dust, control of gas moisture, and furnace pressure control. The \$9 million cost of the entire control program from research through operation is viewed as part of the cost of using Utah iron ore. The equipment is considered unique in that extremely large volumes of gas are continuously undergoing chemical treatment and final cleaning while the final collected product is disposed of.

APTIC-23182

CONSTRUCTION OF BELOW GROUND RESERVOIRS FOR THE STORAGE OF LIQUEFIED NATURAL GAS.

American Gas Association, Inc., New York, Proc. Am. Gas Assoc. Operation Section Conf., 1966, vol. 2:558-563.

Maurice G. Bechtol.

Identifiers: *Design criteria, *Compressed gases, *Storage facilities, *Natural gas, Concrete, Soils.

The procedure employed by Tennessee Gas Pipeline Co. in evaluating the requirements for liquefied natural gas storage in the New England area is outlined. Laboratory tests were made on both the glacial till and the granite of two in-ground storage reservoirs to determine their properties as a function of temperature from ambient to -260 F. Some of the properties determined by these tests included compressive and shear strength, modulus of elasticity, thermal shock, coefficient of thermal expansion, specific heat, and thermal conductivity. A mathematical model of the reservoir was created for an analysis of the heat transfer, and tests were programmed in Fortran and run on a computer. It was decided to incorporate a reinforced concrete ring wall around each of the reservoirs: as a restraint to the glacial till, should the freeze ring deteriorate; to seal off free water in the overburden; and, as support for the roofs of the reservoirs. No lining will be incorporated into the mass of the reservoir extending into the granite formation, the bare granite being utilized as an envelope to contain the product. Construction of the storage reservoirs will consist of four major operations: establishment of a ring of frozen earth around the periphery of the reservoir; removal of the glacial till overburden; installation of the inner roof; and installation of two product withdrawal pumps. More details of these operations are provided, and a section through a LNG storage reservoir is depicted.

APTIC-23184

APPARATUS FOR RECOVERING SULFUR.

(E. I. DuPont de Nemours Powder Co., Wilmington, Del.) U. S. Pat. Appl. 437,645. 4p. June 10, 1908, (5 claims).

Paul S. Smith.

Identifiers: *Sulfur dioxide, *Sulfur compounds, *By-product recovery, Fuel gases, Reduction.

Improvements in the process and apparatus for recovering sulfur from sulfur dioxide are described. In the original process, producer gas and water gas were alternately formed, stored, then mixed with sulfur dioxide to cause the evolution of sulfur vapor. Modifications of the process and equipment permit the producer gas and water

gas to be manufactured continuously rather than alternately, thus dispensing with the necessity to store the gases and allowing both to be lead directly to a reducer. The apparatus of the invention includes a number of steel shell generators lined with fire brick and provided with grates and their accompanying retorts, brick lined steel shells largely filled with fire-brick checker works. Fuel in a generator is brought to temperatures of maximum efficiency for production of producer gas (carbon monoxide and nitrogen) by air blasts. Steam is introduced through the incandescent fuel for the production of water gas. The producer gas is passed to the lower end of a retort and the water gas to the upper end. In the retort, sulfur dioxide becomes mixed with the water gas and reduced to sulfur. The sulfur vapor formed, together with water vapor and carbon monoxide, is then condensed, first to liquid and then to solid sulfur.

APTIC-23185

THE RECOVERY OF SULPHUROUS ACID FROM FURNACE GASES.

J. Soc. Chem. Ind., vol. 3:570-571, Nov. 29, 1884.

Also: Chem. Zeit., vol. 48: 857, 1884.

E. Haeuisch, and M. Schroeder.

Identifiers: *By-product recovery, *Absorption (general), *Sulfurous acid, Germany, Combustion gases, Furnaces, Scrubbers, Design criteria, Inorganic acids, Heat transfer, Water.

A process is described to economically recover sulfurous acid with cold water being used as an absorbent. For the absorption of the sulfur dioxide contained in the furnace gases, a tower is filled loosely with coke, shaped stones or wood lattice work, over which water is kept constantly flowing from above. A regenerator consists of a number of large square flat compartments, each about 4 cm high, made of sheets of lead 3 mm thick, and piled one upon the other, the alternate compartments being connected together by pipes at alternate ends. Hot water enters the top of the regenerator, passes through the uppermost compartment, sinks to that next but one below it, and so on to the second division from the bottom. The hot water thus gives up part of its heat to the cold solution in the intermediate compartments, and thus assists in the respective circulations of the two systems. The warmed solution passes to an arrangement which consists of a series of closed leaden pans placed in, or forming the roof of, the channel through which the heated furnace gases pass to the absorption tower; here the solution becomes further heated to about 98 deg, and begins to yield the dissolved gas. By means of a constant current of cold water circulating through it, another compartment serves to cool the furnace gases still further. A circular tower contains a vertical lead-coated iron rotating shaft carrying at intervals of 0.25 m horizontal lead protected iron discs of 1.5 m diameter. The hot solution falls upon the top rotating disc, and is thrown thence by centrifugal force onto the ring beneath. Rarefaction of the air in the upper part of the tower causes air to enter by the pipe at the bottom of the tower, while the combined action of the heat, air, and agitation causes the solution to give up nearly the whole of its gas. A small experimental plant operation is described.

APTIC-23186

PURIFICATION OF ATMOSPHERIC AIR OF CONTAMINANTS FROM INDUSTRIAL DISCHARGES.

In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Effects and Symptoms of Air Pollutants on Vegetation; Resistance and Susceptibility of Different Plant Species in Various Habitats, In Relation to Plant Utilization for Shelter Belts and as Biological Indicators. M. Y. Nuttonson (ed.), vol. 2. Silver Spring, Md., American Institute of Crop Ecology, 1969, p. 1-5. (Also: Akad. Nauk SSSR Ural. Filial. Komis. po Okhrane Prirody. Rastitel'nost' i promyshlennye zapryazheniya. Okhrana prirody na Urale. V (Sverdlovsk), 1966, p. 7-10.) V. V. Oparin.

Identifiers: *Stack gases, *Control methods, Plants (botany), Ussr, Industrial areas, Combustion products, Dusts, Soot, Fly ash, Smokes, Boilers, Coal, Natural gas, Furnaces, Industrial emission sources, Collectors, By-product recovery, Process modification.

Significant work on an overall solution to air pollution control in the Ural industrial areas was carried out by the Central Ural Sovnarkhoz. The basic steps towards sanitation of the surrounding air included the construction of new and the updating of existing purification installations, improvement of their utilization, organization of research programs, and utilization of valuable products in industrial discharges. Atmospheric purification in industrial areas is conducted by construction of dust catchers and gas utilization shops; change in technological processes; establishment of protective belts of verdant plantings around industrial plants; and the closing of certain industrial plants. Many industries are changing from coal to oil, which is expected to greatly reduce ash, dust, and smoke emissions.

APTIC-23189

TRANSCO'S LNG OPERATIONS.

American Gas Association, Inc., New York, Proc. Am. Gas Assoc. Operation Section Conf., 1966, 2:66 413-4446. (Presented at the American Gas Association Transmission Conference, Dallas, Texas, May 9, 1966.)

W. W. Cofield.

Identifiers: *Storage facilities, *Natural gas, *Compressed gases, Construction materials, Concrete, Steel, Soils, Carbon dioxide, Heat transfer, Compression.

The liquefied natural gas facility described has a storage capacity for 1 Mmmcf of natural gas, can fill this reservoir at the rate of 5 Mmscf/day, and can withdraw from the unit at the rate of 200 Mmscf/day. Prior to liquefaction, feed gas is pre-treated in a MEA system to remove carbon dioxide and in a slow cycle dehydrator to remove water. The dehydrator is equipped with dual afterfilters which trap desiccant dust. The purified feed gas is pre-cooled with propane to around -35 F in two external heat exchangers. Around -35 F the gas streams enter the cold box containing the heat exchangers and cryogenic vessels that operate at lower temperatures. Inside the cold box the feed gas is first cooled to around -99 F by counter-current exchange with flash gases, then to -143 F in a two-stage ethylene cooler. To prevent reevaporation of the liquid, two additional flash cooling stages are imposed. The final temperature is about -248 F. At this point the liquefied gas is transmitted in a heavily insulated stainless steel line to a frozen in-ground reservoir. The wall of the storage unit is concrete and the roof 9% nickel steel. For send-out, the liquid gas is vaporized in uniflux heater employing isopentane as the heat transfer medium. An evaluation of equipment performance is included.

APTIC-23194

METHANE FUEL SYSTEMS FOR HIGH MACH NUMBER AIRCRAFT.

Preprint, Society of Automotive Engineers, Inc., New York, 15p., 1969. 19 refs. (Presented at the National Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 6-10, 1969, Paper 690668.)

Stanley Greenberg.

Identifiers: *Methanes, *Compressed gases, *Fuels, *Jet aircraft, Natural gas, Operating variables.

Problems and limitations associated with JP fuels (aviation fuels utilizing kerosene type hydrocarbon fuels) at high Mach numbers have led to an interest in fuels with better heat sink and high temperature capabilities such as methane. Studies have shown methane to offer performance advantages for SST aircraft relative to JP, but the overall attractiveness of methane will depend

upon the extent advantages are nullified by practical disadvantages. Problems and penalties of storing methane in an aircraft constitute some of the important practical disadvantages. Several representative methane storage schemes for Mach 3-6 transport aircraft are evaluated, primarily on the basis of minimum weight. Fuel system weight (including tankage, insulation, plumbing, and boiloff) is 6.3-13.6% of the fuel weight for methane, depending upon the type of storage scheme used and upon the aircraft speed and range. By contrast, fuel system weight for JP is 2.5-3% of the fuel weight. Effects of the fuel system fraction (ratio of fuel system to fuel weight) upon payload are shown. This report serves as a 'primer' on the topic of methane storage in aircraft. It also brings unresolved issues into sharper perspective and suggests what should be done to clarify the future role of methane as an aircraft fuel. (Author abstract)

APTIC-23204

DEPOSITION OF AEROSOL PARTICLES IN FIBROUS FILTERS.

Am. Inst. Chem. Engrs. J., 7 (2):203-210, June 1961. 17 refs.

D. G. Thomas, and C. E. Lappe.

Identifiers: *Deposition, *Aerosols, *Glass fabrics, Operating variables, Particle size, Filter fabrics, Mathematical analyses, Diffusion, Flow rates, Density.

The collection efficiency of glass fiber pads was investigated with a super cooled liquid aerosol. A filter-velocity range of 0.02 to 20 ft/sec was covered with filter pads having a bulk density ranging from 1 to 10 lb/cu ft and a fiber diameter ranging from 1 to 30 micron. For the aerosol employed, the results showed a minimum collection efficiency at a velocity of 2 to 5 ft/sec, dependent on fiber size. At the lower velocities, where diffusion is controlling, collection efficiency increased with decreased velocity; at higher velocities, where inertia is controlling, efficiency increased with increased velocity. For purposes of generalization a method is presented by which the data were correlated in terms of dimensionless parameters which allow for the combined effects of flow-line interception, inertial interception, and diffusional deposition. Evaluation of the data in terms of existing theories of deposition indicated nominal agreement with the theory of Langmuir, as modified by Natanson, for diffusional deposition. For inertial deposition, the measured collection efficiencies were considerably lower than would be predicted from the theoretical values reported by Langmuir and Blodgett for potential flow around the fibers, presumably because of the viscous-flow (low Reynolds number) conditions that prevailed in this study. (Author abstract modified)

APTIC-23205

REDUCTION OF SULFUR DIOXIDE WITH HYDROGEN AND CARBON MONOXIDE IN THE TEMPERATURE RANGE 300-850 DEGREES.

(Ueber die Reduktion von Schwefeldioxyd mit Wasserstoff und Kohlenoxyd im Temperaturgebiet von 300 bis 850 Grad.) Text in German. Z. Angew. Chem. (Weinheim), 45 (8):164-171, 1932. 9 refs.

Ernst Terres, Kurt Schultze, and Hermann Fortkord.

Identifiers: *Hydrogen, *Reduction, *Carbon monoxide, *SO₂ removal (combustion products), Germany, Combustion gases, Carbon dioxide, Sulfides, Hydrogen sulfide, Recombination, Reaction kinetics, Temperature.

The reduction of sulfur dioxide with carbon monoxide and hydrogen in the temperature range 300-850 C involves equilibrium reactions that participate as partial reactions in the generator and during the purification of the sulfur. These phenomena are studied experimentally. The reaction constants are of such a nature that the reduc-

tion of SO₂ either by carbon monoxide or by hydrogen has a quantitative behavior in the portion of the given temperature range below 600 C. As temperature continues to increase, the value of these constants diminishes, but at 800 C they still amount to about 80% of their original values. The rate of reaction is relatively small, but not so small that, at values of 300 C and below in CO reduction and of 350 C in H₂ reduction, this reaches values of an order of magnitude that will permit technical evaluation of the reactions. The reduction of SO₂ with CO yields a secondary reaction at higher temperatures: carbon oxysulfide or carbon sulfide and carbon dioxide. When the hydrogen method is used, a further reaction of the liberated sulfur with hydrogen to form hydrogen sulfide occurs at temperatures above about 800 C. Two other reversible reactions occur: sulfur with water to form H₂S and SO₂; SO₂ with hydrogen to form water and H₂S. No experimental data had been obtained for the latter 2 reactions at the time of writing, but measurements of the earlier-mentioned phenomena gave observed results that agreed well with calculated data.

APTIC-23211

A MATHEMATICAL MODEL FOR FILTRATION AND THE DETERMINATION OF THE RATE OF FILTRATION ON THE BASIS OF PERMEATION EXPERIMENTS.

(Ueber ein Modellgesetz der Filtration und die Bestimmung der Filtrationsgeschwindigkeit auf Grund von Durchdringungsversuchen.) Text in German. Chem. Tech. (Berlin), 17 (1):16-21, Jan. 1965. 7 refs.

Heinz Robel, and Peter Guentzschel.

Identifiers: *Mathematical modeling, *Flow rates, *Filters, Germany, Liquids.

The flow of filtrate through a filter cake of constant thickness can be expressed as the function of 2 nondimensional factors, coefficient of friction and Reynolds number; in the case of vacuum filtration, there is a linear relationship between these two factors, such that their product is always equal to 160. This suggests the possibility of calculating the rate of flow of the filtrate through an ideal vacuum filter on the basis of simple laboratory experiments with arbitrarily chosen operating conditions (vacuum level, content of solid material, sludge temperature, and thickness of cake). An ideal vacuum filter is defined as one in which the resistance of the filtering agent and the loss of flow on the inner side of the filter are negligible, which exists when there is a relatively large cake thickness. The final resistance of the filtering agent can probably not be determined with the requisite accuracy except by the use of a modeling procedure, which is presently being investigated by Soviet scientists. The accuracy of the method proposed by Kafarov and Malinovskaya will have to be judged on the basis of comparative studies with industrial filters. Studies of the filter resistance problem and the accuracy of calculations performed by the above-mentioned method will be the subject of a forthcoming article.

APTIC-23212

THE 1970 GENERAL MOTORS EMISSION CONTROL SYSTEMS.

Preprint, Society of Automotive Engineers, Inc., New York, 13p., 1970. 5 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 12-16, 1970, Paper 700149.)

Jack B. King, Harold R. Schneider, and Robert S. Tooker.

Identifiers: *Automotive emission control, Engine exhausts, Crankcase emissions, Crankcase ventilation air, Fuel tank evaporation, Internal combustion engines, Automobiles, Air-fuel ratio, Carburetion, Spark timing, Engine design modification, Maintenance, Hydrocarbons, Carbon monoxide, Temperature.

The Controlled Combustion System (CCS) and Air Injection Reactor (AIR) permit General Motors passenger cars and light trucks to meet the stricter

1970 Federal levels of 2.2 grams of hydrocarbons and 23 grams of carbon monoxide per vehicle mile. Required in California, the Evaporation Control System controls evaporative emission losses to the 6 gram per test limit. Each engine is matched with a carburetor specifically calibrated throughout the operation range to yield optimum air-fuel mixture. Most CCS vehicles are equipped with carburetor air preheaters with temperature control to simulate summer conditions year-around. Higher idle speed is employed on some engines to improve combustion at idle and on deceleration, while throttle return checks reduce 'decel' hydrocarbon emissions. Attention is given to the manifold design for passage sizes, surface quality, and port matching to achieve good entrainment of the mixture. Some engines are equipped with ported spark and transmission controlled spark, while a thermostatic coolant temperature switch is used to over-ride the normal spark timing. The AIR system is comprised of an engine-driven air pump, equipment to deliver air to each exhaust port, carburetor modifications, distributor and vacuum advance modifications, and recommended maintenance. Components of the Evaporation Control System include: a fuel tank with a built-in chamber to provide an assured thermal expansion volume for the fuel; tank vent system; a vapor-liquid separator to allow only liquid-free vapor to pass from the fuel tank vents to the carbon canister; pressure-vacuum relief; a canister containing 625 grams of activated carbon and including a serviceable purge air filter; purge control; carburetor vapor control; and recommended maintenance. An appendix includes the evaporative emission test procedure.

APTIC-23218

COST, APPLICATION AND PERFORMANCE OF SERIES DUST COLLECTOR INSTALLATIONS ON LARGE PULVERIZED COAL BOILERS.

Preprint, Smoke Prevention Assoc. of America, New York, 8p., 1952. (Presented at the Air Pollution and Smoke Prevention Association of America Annual Convention, 45th, Cleveland, Ohio, June 9-12, 1952.)

L. W. Cadwallader.

Identifiers: *Fly ash, *Steam plants, *Collectors, *Electrostatic precipitators, Costs, Dusts, Boilers, Electric power production.

The efficiency of a mechanical collector increases with load, while the efficiency of an electrostatic precipitator decreases with load. For two pulverized coal-fired generating stations, the combination of electrostatic precipitators and mechanical collectors into a series unit has resulted in a sustained high collection efficiency throughout a wide range of load. The series dust collector appears to be particularly well adapted for optimum fly ash collection. Of the two installations, the stacks at the station where the mechanical collector is placed before rather than after the precipitator present the most pleasing appearance. A capital expenditure of approximately \$5.00 per nameplate KW is required to provide efficient series dust collector installations with necessary auxiliary equipment on large pulverized coal-fired boilers. This cost would be increased substantially where changes to buildings and foundations or the use of structural steel are required to accommodate the fly ash collectors and the additional loads imposed by them. Operating and maintenance costs for the two stations described are summarized.

APTIC-23220

RECOVERY OF SULFUR DIOXIDE FROM COAL COMBUSTION STACK GASES.

In: Problems and Control of Air Pollution. O. S. Mallette (ed.), New York, Reinhold, 1955, Chapt. 15, p. 155-169. 12 refs. (Also: Chapman and Hall, Ltd., London.)

L. B. Hein, A. B. Phillips, and R. D. Young.

Identifiers: *Absorption (general), *Ammonium compounds, Feasibility studies, Stack gases, Coal, Steam plants, Pilot plants, Scrubbers, Packed

towers, By-product recovery, Design criteria, Sulfuric acid, Sulfates, Sulfites, Flow rates, Ph, Volatility.

Feasibility studies of removing sulfur dioxide from steam plant emissions were undertaken at the laboratories at Wilson Dam, Alabama, and pilot-plant work was carried out on the absorption of SO₂ by ammonia solutions. The major variables studied were the recirculation rate, pH, and concentration of the scrubbing liquor and the depth of packing and gas velocity in the scrubber. Equipment for burning pulverized coal, for cooling and humidifying the gas, and equipment for scrubbing the gas with an ammonium sulfite-bisulfite solution comprised the pilot plant. Recovery increased with increased recirculation rate up to about 5 gallons per minute and leveled off above this value, and as the pH was raised from 5.6 to 6.8, recovery increased from 0 to 90%. SO₂ recovery was practically all below pH 5.6, and the volatilization of ammonia was so great above 6.8 that constant pH could not be maintained. Increasing the pH would result in an increase in the proportion of ammonium sulfate and a decrease in the proportion of sulfuric acid produced as end products. The liquor rate required to obtain a given recovery increased as the depth of packing was decreased. At a pH of 6.4, recovery of SO₂ decreased and the loss of ammonia increased as the concentration of the scrubbing liquor was increased. Data were obtained for calculating ash, sulfur, ammonia, and water balances for the period of operation. Tests of 5 to 12 hours duration indicated that virtually all of the ammonia could be recovered from the scrubber exit gas by scrubbing with dilute ammonium sulfite-bisulfite solution in a second stage tower. About 90% of the SO₂ was evolved during acidification, while tests showed that the scrubber effluent could be acidified satisfactorily in a continuous flow manner. Crystallization tests were made in beakers to determine the purity of the ammonium sulfate produced and to indicate whether impurities would interfere with crystallization.

APTIC-23221

THE ALGERIA-UNITED KINGDOM LIQUEFIED NATURAL GAS PRODUCT (LNG SYMPOSIUM).

American Gas Association, Inc., New York, Proc. Operating Section Conf., Am. Gas Assoc., 1965:180-187.
C. G. Filstead Jr.
Identifiers: *Methanes, *Compressed gases, *Transportation, Africa, Great Britain, Natural gas, Ships, Design criteria, Compression.

The origin of the liquefied natural gas importation scheme is reviewed, and the many companies and nations involved in the Algerian/UK methane project are indicated. Hassai R'Mel field is considered to be the world's third largest natural gas reservoir, following the Panhandle Field, Texas, and the Groningen Field, Netherlands. Gas reserves have been estimated at 70 trillion scf, but the probable recoverable natural gas reserves are 35.3 trillion cu ft. Welded flow lines connect each gas well to the field processing center, where low-temperature equipment removes the condensate, and the 100 psi residue gas is delivered to the 24-in. pipeline. Without compressor stations, the pipeline connecting Hassai R'Mel and the Mediterranean coast can handle 155 million cfd, but three compressor stations can increase the throughput to 271 million cfd. The CAMEL liquefaction process uses a cascade cycle designed around steam turbine-driven centrifugal compressors. After the feed gas is purified, it is split into three equal streams and enters the liquefaction lines. There are three conventional aboveground metal tanks, each containing 69,000 bbl LNG, and one in-ground cavity containing 240,000 bbl. Auxiliary facilities and plant start-up are described. To accommodate the LNG tankers and liquefaction plant, extensive harbor works and land reclamation were necessary at Arzew. The 'Methane Princess' and the 'Methane Progress' have double hulls throughout the length of the cargo space,

with coffer dams to divide the double hull into three insulated cargo holds. Some special and rather unusual features of these tankers are described, as they were designed especially for this low-temperature service. Liquid methane is stored in five 4000-long-ton-capacity aboveground insulated tanks at the Canvey Island terminal. Facilities at the terminal and Great Britain's pipeline system are reviewed. Gaz de France, the French gas distribution organization, takes one-third of the CAMEL plant's liquefied gas production.

APTIC-23223

NATURAL GAS LIQUEFACTION PILOT FACILITY OPERATED FOR 2300 HOURS.

American Gas Association, Inc., New York, Proc. Am. Gas Assoc. Operating Section Conf., 1964:47-48.
Merwin B. Clapp.
Identifiers: *Compressed gases, *Natural gas, *Pilot plants, Construction materials, Steel, Design criteria, Compression, Heat transfer, Vapors.

A double-wall tank and a complete natural gas liquefaction plant were operated for about 2300 hours to provide design criteria for the 160 MMcf LNG storage-with-liquefaction unit. The inner tank is constructed of 9% nickel steel and the outer tank is carbon steel. A load bearing polyurethane foam comprises the bottom insulation, while the side walls are insulated with a thickness of 36 in. of granular perlite confined between the inner and outer steel shells. The outer tank operates at the same pressure as the inner tank and contains warm product vapor which expands and contracts with changes in ambient temperature and barometric pressure. Sprayed-on urethane as roof insulation, and urethane with an impermeable reinforced fiberglass liner on sides and bottom, were also evaluated in the pilot tank. Thermocouples provided temperature profiles during cool-downs and normal operation of the tank. Basic components of the liquefaction cycle are a multi-stage natural gas compressor, a frozen chiller, a reboiler pump, vaporizer, and an automatic control system. Tests were conducted to evaluate the efficiency of various types of dehydration and carbon dioxide extraction equipment. Of particular importance was the evaluation of the frozen, countercurrent, and air vaporizer cryogenic heat exchanger applications. Liquid and vapor samples were obtained at appropriate points and piped to a chromatograph. Pressure gauges were provided, as well as gas and liquid flow meters. Freezing and heat transfer characteristics of an air vaporizer were determined, and the response of the automatic control system was studied.

APTIC-23224

PROGRESS IN LPG AND LIQUID NATURAL GAS VAPORIZATION.

American Gas Association, Inc., New York, Proc. Am. Gas Assoc. Operating Section Conf., 1964:38-43.

Wayne Louzler, George Lowry, George Ellis, and Paul Woodnorth.

Identifiers: *Propanes, *Compressed gases, *Vaporizers, Natural gas, Operating variables, Flow rates, Vapors, Pressure, Temperature.

Liquefied propane gas vaporizers are primarily used where there is a need for peak-shaving a natural gas fuel system. The vaporized LPG can be mixed with the proper proportion of air so that no change in the BTU release is obtained with the same controller or valve setting. Indirect heating with water as the heat transfer medium is the most widely used method of vaporizing LPG today. Antifreeze solution is often added to the water bath. Basic types of LPG vaporizers in use today are discussed and classified as direct fired, indirect fired, steam jacketed or steam heated, combination steam and water bath indirect fired, and UNIFLUX. Comparative features of various types of vaporizing systems are presented tabu-

larly. The following information is generally required for proper sizing of LPG vaporizers: flow rate, type of LPG or specific gravity, minimum inlet temperature, maximum outlet temperature, inlet pressure, allowable pressure drop through the unit, and type of fuel. Standard and optional accessories are listed with an explanation of their functions. The UNIFLUX heater, which is basically a convective type, fired heat exchanger, is described in detail.

APTIC-23225

STATUS OF LNG STORAGE.

American Gas Association, Inc., New York, Proc. Am. Gas Assoc. Operating Section Conf., 1964:112-119, 9 refs.

A. R. Khan, T. J. Joyce, and J. Huebner.
Identifiers: *Compressed gases, *Storage facilities, *Natural gas, Costa, Concrete, Aluminum, Steel, Nickel, Soils, Operating variables, Freezing.

There are at present three methods of liquefied natural gas storage available to the gas industry: aboveground metal tanks, cryogenic in-ground storage, and below-ground pre-stressed-concrete tanks. Aboveground tanks which exist and those under construction are presented tabularly. The inside wall is aluminum, stainless steel, or 9% nickel steel; the outside wall is carbon steel. Normal boiloff rates in these tanks, when full, range from 0.05 to 0.10% per day of the total tank capacity, although insulation thickness can be varied to reduce heat leak. While evaporation rates are higher for frozen in-ground storage units than for insulated systems, they offer other advantages such as no attending maintenance costs. Problems of spillage and diking do not arise with the pre-stressed-concrete tanks either, and maintenance is at a minimum. Land requirements, investment costs for liquefaction, regasification, improvements and auxiliaries, labor, and maintenance are necessary considerations for any individual economic evaluation. Storage costs are presented graphically for aboveground, double-walled metal tanks and below-ground, pre-stressed-concrete tanks. The profitability of LNG storage systems at different boiloff rates for 250 days of liquefaction is also depicted.

APTIC-23226

FLUE GASES LAUNDERED TO PREVENT AIR POLLUTION.

Power Plant Eng., 42 (6):393-396, June 1958, 9 refs.

R. V. Kleinschmidt.

Identifiers: *Scrubbers, *By-product recovery, *SO₂ removal (combustion products), Stack gases, Electric power production, Steam plants, Design criteria, Sulfuric acid, Sulfates, Sulfites.

The large tonnage of sulfur dioxide now discharged into the air from power plant stacks, especially in the Midwest where high-sulfur coals are burned, creates a serious corrosion problem in industrial communities and is inimical to plant life over a wide area. The successful development of the Pease-Anthony scrubber, which has a high efficiency for both dust and SO₂ removal, makes it advisable to consider wet treatment of flue gases in preference to electrical precipitators and cyclones. The Pease-Anthony scrubber consists of a vertical cylindrical chamber with a tangential gas inlet at the bottom and a central discharge collar at the top. Spray nozzles located along the lower portion of the axis of the cylinder discharge a fine spray of water or other washing fluid into the center of the rotating gas mass. The thoroughness of contact between liquid and dust particles is indicated by the fact that the gases are brought to equilibrium saturation temperature. The economics of SO₂ removal depend largely on local conditions; under favorable conditions, recovery should be possible at practically no net cost to the power plant. Forms in which sulfur can be recovered for sale include sulfuric acid, sulfites and sulfates, and liquid SO₂.

APTIC-23231

SULFUR FROM INDUSTRIAL GASES.

Petrol. Process., 7 (3):333-338, March 1952. 35 refs.

Paul Zurcher.

Identifiers: *Fuel gases, *By-product recovery, *Sulfur compounds, Petroleum refining, Absorption, Peter spence process (claus), Sulfur dioxide, Hydrogen sulfide.

A discussion is presented of the more important developments in the recovery of sulfur from petroleum and other gases. Not counting coal gas, industrial gases contain more than 11 million tons of sulfur. If economics could justify the recovery of only 15% of this, present sulfur demands could be met. Common practice in the gas industry is to separate the hydrogen sulfide from gas by an absorption process and to convert the concentrated hydrogen sulfide into elemental sulfur. When the hydrogen sulfide content of a gas is low, the iron oxide process of the coal gas industry may be the most economical means of purification. A particular advantage of the process is that the gases are freed of carbonyl sulfide, carbon disulfide, and hydrocyanic acid. A transition stage from the iron oxide to a continuous regeneration process consists in suspending the iron oxide or hydrate in a solution of soda ash and countercurrently contacting the slurry with the gas. Other processes replace the solid iron oxide in soda ash with a chemical compound in solution which reacts with hydrogen sulfide and releases it upon heating or blowing with air. One of these is the Girbotol process that uses organic compounds as absorbents. Most processes for converting hydrogen sulfide to elemental sulfur are modifications of the Claus process in which the hydrogen sulfide is mixed with air. One modification permits natural gas to be desulfurized without the intermediate step of extracting the hydrogen sulfide. One commercial plant that utilizes the Claus principle has reduced the sulfur dioxide content of its exhaust gases to 0.5% and emits no hydrogen sulfide to the atmosphere. Another plant collects hydrogen sulfide from waste gases of several refineries in the form of foul diethanolamine solution, converts it to sulfur, and returns the diethanolamine to refineries under sufficient pressure to complete the cycle. In a departure from the Claus process, hydrogen sulfide is not oxidized; instead some of the sulfur already formed is burned and added to the gas.

APTIC-23232

THE APPLICATION OF AIR POLLUTION RESEARCH TO POWER STATION DESIGN.

For primary bibliographic entry see Field 14.

APTIC-23237

THE AIR IN APPALACHIA: TECHNOLOGY TO CONTROL AIR POLLUTION.

Appalachia, 3 (9):4-10, June-July 1970.

William J. Moroz.

Identifiers: *Control equipment, *Lasers, *Control methods, Engine exhausts, Stack gases, Aerosols, Fuels, Stacks, Internal combustion engines, Air quality measurements, Sampling probes, Centrifugal separators, Electrostatic precipitators, Bag filters, Packed towers, Venturi scrubbers, Automotive emission control, Process modification, Gravity settling, Desulfurization of fuels, Dispersion.

Five categories of air pollution abatement and control methods are discussed. A variety of efforts are underway to improve and/or develop a substitute for the internal combustion engine. Federal emissions standards for some cars and trucks went into effect in 1968, and have recently been made more stringent. The composition of vehicular fuels is coming under control; industrially, the emphasis is on shifting from high-sulfur coal and oil to natural gas or low-sulfur coal, and on reducing the sulfur content of fuels prior to use. If production processes can be made more efficient, the same output will require less fuel, and pollution will thus be decreased. Plants must be properly sited and adequate provisions made for meteorological dispersion from tall stacks. A variety of devices

for contaminant removal are in current use. Those described in some detail for removing aerosols are the gravitational settling chamber, cyclones, bag house filters, electrostatic precipitators, and conventional and venturi scrubbers. Packed towers and adsorption columns are noted for removal of gaseous pollutants. The laser air pollution probe, a new system designed to provide high-speed sequential measurement of particulates, is described for indicating the degree of concentration at various distances within the 5-mi range of the measuring device. The probe is potentially applicable to a rapid and flexible 'early warning system' for imminent acute air pollution episodes.

APTIC-23240

AIR POLLUTION IN APPALACHIA: AIR POLLUTION AND PLANT LOCATION.

For primary bibliographic entry see Field 14.

APTIC-23241

PROBLEMS IN DUST REMOVAL FROM THE WASTE GASES OF IRON ORE SINTERING PLANTS.

(Probleme der Sinterabgasentstaubung bei Eisenerzsinteranlagen). Text in German. Stahl Eisen, vol. 88:1414-1422, Dec. 12, 1968. 10 refs. (Presented at the Commission on Power Economics and Thermal Engineering, 1968th General Session, Duesseldorf, June 14, 1968.)

Rolf Bothe.

Identifiers: *Dusts, *Primary metallurgical processing, *Control equipment, Iron, Germany, Operating variables, Collectors, Electrostatic precipitators, Filters, Design criteria, Sulfur oxides, Water.

The evolution of processes for the removal of dust from sintering gases is traced, from the earlier mechanical devices to the present-day electrostatic filters. Practical experience with their installation and use are presented, together with comments on the influence of the filter on industrial processing techniques, with reference to its technical possibilities and limitations. The special problems of dust removal in older sintering plants is also dealt with. A basic distinction is made between the dust problems created by the actual sintering process and those created by the transport of materials and other related operations of the plant; the former problem is dealt with here. In 1960, the first electrostatic filter was installed in Europe in a West German steel mill. At the date of writing, there were four modern iron smelting plants in Europe that made use of the electrostatic process for dust removal. Electrostatic filters operate most efficiently when the electrical resistance of the dust is in the range of 10 to the 4th power -10 to the 11th power OHMS/cm. In the past few years, there has been a dramatic change in the type of iron ore supplied to German steel mills. Whereas previously the domestic ore dominated the market, the amount of domestic ore now used has shrunk to about 1/9th of the total. The new supplies, coming from such places as Africa, has a lower content of chemically bound water and little or no sulfur content. Both water vapor and sulfur oxides have an influence on dust resistance.

APTIC-23245

INCREASING THE EFFICIENCY OF EXISTING PLANTS FOR REMOVING THE DUST FROM BLAST FURNACE GASES.

(Leistungssteigerung vorhandener Anlagen zur Hochofengasentstaubung). Text in German. Stahl Eisen, vol. 89:30-35, 1969. (Presented to the Industry Club, Duesseldorf, West Germany, Jan. 19, 1967.)

Rolf Bothe.

Identifiers: *Dusts, *Blast furnaces, *Control equipment, Germany, Stack gases, Collectors, Centrifugal separators, Electrostatic precipitators, Filters, Venturi scrubbers, Wet cyclones.

New improvements are possible in equipment for the purification of stack gas, thanks to recently acquired insights into the operation of the equipment, bolstered by experimental data. Dry mechanical separation is modified by the introduction of auxiliary cyclones the output of which passes through a collection point. There are also changes in the wet processes and electrostatic equipment that benefit both the throughput capacity and the filtering efficiency. The proper designing of a voltage transformer for the auxiliary electrostatic filter is discussed. In the modern blast furnace air filtering system, a prefilter reduces the particulate content of the waste gases from 10-30 g/cu m to a content of 3-10, sometimes 15 g/cu m. After this coarse stage of filtering, the exhaust is subjected to finer filtering stages, which could be a combination of wet and dry processes; the final goal is a pollutant content of less than 1 mg/cu m for a gas turbine operation and 15 mg/cu m for a boiler plant. The practicality of a variety of combinations of various types of filters is discussed, and a model is given for the updating of existing equipment, which in the example given includes installing an auxiliary cyclone and venturi tube; modifying the scrubber, the interior of the electrofilter and the voltage transformer; and enlarging the electrofilter. The use of thyristor circuits is discussed.

APTIC-23246

CONVERSION OF AMMONIUM SULFITE-BISULFITE SOLUTIONS TO AMMONIUM SULFATE AND ELEMENTARY SULFUR.

(Pererabotka rastvorov sul'fit-bisul'fita ammoniya na sul'fat ammoniya i elementarnuyu seru). Koks i Khim., no. 1:48-53, 1956. 9 refs. Translated from Russian. Israel Program for Scientific Translations, Jerusalem, 9p. CFSTI: TT69-55039

B. A. Chertkov.

Identifiers: *Absorption (general), *Hydrogen sulfide, *Ammonium compounds, *Coke-oven gas, USSR, Coke, Fuel gases, By-product recovery, Catalytic oxidation, Sulfur compounds, Sulfates, Decomposition, Reaction kinetics, Pressure, Temperature.

There is wide interest in utilizing ammonium sulfite-bisulfite solutions to produce ammonium sulfate fertilizer since the solutions can be converted to sulfate without expenditure of sulfuric acid. Furthermore, sulfur-containing waste gases provide an unlimited source of ammonium sulfite-bisulfite. In the 'catsulf process,' hydrogen sulfide from coke oven gas is catalytically oxidized to sulfur dioxide, which is then absorbed together with ammonia to form the sulfite-bisulfite mixture. The latter is processed in an autoclave at high temperature to ammonium sulfate and elementary sulfur. Disadvantages of the process are that the decomposition of the sulfite-bisulfite mixture in the autoclave has to be performed at high pressure and that the autoclave must be made of heat resistant materials. As determined by a kinetic study of the process, decomposition of the ammonium sulfite-bisulfite solutions to ammonium sulfate and elemental sulfur can be performed within a technically acceptable time (1.5 hr) in an open apparatus under normal pressure. For this purpose, the solution must be vigorously mixed in the first stage of the process with a large excess of sulfur, and at the same time heated to 100-105 deg to accelerate the formation of intermediate ammonium thiosulfate. After the required thiosulfate concentration is reached, the solution must be acidified (with H2SO4 or SO2) to convert the residual sulfite to bisulfite and to accomplish complete decomposition of the solution. Pilot-plant tests of the technique could result in the early application of more efficient methods of purifying sulfur-containing gases, including techniques for the simultaneous utilization of NH3 and H2S from coke oven gas.

APTIC-23249

Field 2—CONTROL METHODS

THE SEARCH FOR LOW EMISSION VEHICLE PROPULSION.

Preprint, American Society of Mechanical Engineers, New York, 13p., 1969. 87 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, Los Angeles, Calif., Nov. 16-20, 1969, Paper 69-WA/Eng-4.) S. William Gouse Jr.

Identifiers: *Steam engines, Automotive emissions, Operating variables, Electric propulsion, Gas turbines, Internal combustion engines, Automobiles, Buses, Trucks, Automotive emission control, Design criteria, Nitrogen oxides.

Recent developments in internal combustion engine design are reviewed and put into perspective in relation to the overall problem of obtaining a low emission automotive vehicle propulsion power plant. The Stirling engine operates at a high thermal efficiency when its potential can be properly utilized; it is silent, and has desirable emission characteristics. Because it operates at higher temperatures than the Brayton cycle or the external combustion Rankine cycle, the nitrogen-oxide compounds in its emission are of higher percentage than the others. Because of the expensive materials required in its construction, applications must be thought of in terms of trucks and buses rather than the private automobile. The open Brayton cycle engine does not have a large heat-rejection heat-exchanger requirement as does the closed-cycle Stirling engine. However, it does require a regenerative heat exchanger, and applications would again be relevant to commercial and military vehicles. Some work currently underway in relation to internal combustion engines includes mechanical rear-arrangement of the crank-connecting rod, emission control equipment, and stratified charged combustion and/or operating the reciprocating engine on a Brayton cycle by making use of a steady constant pressure combustion process. Emission data for various power plants are presented tabularly. The Rankine cycle and objections to it are discussed in detail, and a number of projects presently underway are summarized. When scaling a Rankine cycle engine, the power output is approximately proportional to the cube of a characteristic length of the engine, while the heat-transfer area available for heat rejection through the condenser varies approximately as a square of a characteristic length. Thus, the physical size of a condenser has to increase at a greater rate than the size of the engine. Water consumption, weight, start-up time, lubrication and fouling, engine control, freezing of working fluid, and maintenance and reliability are also discussed. There can be little doubt that a Rankine cycle engine, inherently clean without the addition of complex control equipment, will be simpler to operate and require less maintenance both in quality and sophistication than the internal combustion engine.

APTIC-23253

DEVELOPMENT OF ARMY UTILITY AIRCRAFT MODEL U-21A.

Preprint, Society of Automotive Engineers, Inc., New York, 6p., 1969. (Presented at the National Business Aircraft Meeting, Wichita, Kan., March 24-28, 1969, Paper 690315.) J. A. Voortkamp.

Identifiers: *Dusts, *Aircraft, *Inertial separation, Gas turbines, Control equipment.

A short report is given on the development and early production of the Utility Aircraft model U-21A in accordance with Army specifications. The major changes to meet specific performance and useful load requirements are outlined, and several problem areas discussed, especially testing of electronic navigational and communications equipment. A dust separator is under development to prolong the life of the turbine engine in planes operating from dusty unimproved runways. By use of engine bleed air, a sufficiently high air velocity can be induced across the engine inlet to prevent a high percentage of air laden dust from being drawn up into the engine which is in effect, an inertial separator.

APTIC-23259

PACKED COAL BED AS A DUST COLLECTOR

(II). Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2 (1):98-100, 1967. Translated from Japanese. 8p. Akio Ito, Taduo Shirasawa, Tomio Ohyanagi, and Yukio Tamori.

Identifiers: *Dusts, *Coal, *Filters, Japan, Combustion gases, Smokes, Furnaces, Incineration, Particle size, Fans (blowers), Flow rates.

Dust collection using packed coal was studied for treatment of the exhaust of coal-fired furnaces and incinerators. The coal from which smoke was collected was fed into a combustion chamber, so that no dust trapping device was needed and operation could be achieved with only a single collector. Generally, in the case of filtration, collection efficiency is improved due to the deposition of smoke on the filter. However, the flow rate of gases is reduced due to thickening of the smoke layer, provided that the power of the suction or blower is maintained constant. Consequently, it is uncertain whether the rise of collection efficiency was due to formation of the dust layer or to the reduction of flow rate. In this experiment, the equipment was improved so that both effects could be separately evaluated. An experimental equation of pressure loss and collection efficiency was derived for a nearly uniform size of coal layer which was produced by sieving. An experiment was also conducted on packed beds of spherical active carbon and glass spheres in order to elucidate the feature of the coal bed in comparison with the above two standard beds. In this type of collector, the amount of coal employed for dust collection and that consumed for the combustion was balanced; this requirement imposed restrictions on the thickness of packed bed, flow rate of exhaust gas, area of beds, and interval for replacement of coal. For a given coal consumption, the gas flow rate was roughly determined, and the area of the bed was derived from the optimum face velocity. Beds of 7 and 14 cm thickness were tested. On determining the optimum thickness of the beds, the interval of time for the replacement of coal was derived. This procedure provided the standard for practical design of a coal bed. The smoke-laden gas of fixed volume was drawn through circular filters up- and downstream of the smoke collector, and the amount of smoke was determined by measurement of light reflectivity of the filter surface on which the smoke was deposited.

APTIC-23262

REMOVAL OF SO₂ BY FILTER IMPREGNATED WITH ALKALI.

Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2 (1):98-100, 1967. Translated from Japanese. 8p. Toshiichi Okita, and Masahiko Enomoto.

Identifiers: *Filters, *Alkaline additives, Japan, Humidity, Hydroxides, Potassium compounds, Sodium carbonate, Sodium hydroxide.

The superiority of filters impregnated with chemicals for collecting and analyzing atmospheric trace gases has led to experimentation of the above principle in the removal of gases. The removal of sulfur dioxide from air was tested using Philedon and Bonden filters impregnated with alkali. P15/500 Philedon and No. 291 Bonden filters were soaked in 20% aqueous solutions of alkalis such as NaOH, KOH, and Na₂CO₃, with 10% of glycerine added, and dried at 80 C. The filter was fitted to a wind tunnel and its collection efficiency was measured for an SO₂ concentration on the order of 10 ppm. The face velocity through the filter ranged from 46 to 96 cm/sec; pressure drop across the filter was 1 mm of H₂O. Collection efficiency by the Philedon filter was 60 - 70%. Efficiency by the Bonden filter was initially almost 100% but the efficiency gradually dropped with prolonged operation of the filter. The rate of reduction of efficiency was largest with the filter impregnated with Na₂CO₃. With the filters impregnated with NaOH and KOH, nearly equal reductions of efficiency were observed. Although the experimental values were

scattered for individual filters, the collection efficiency was still 80% even after 10 ml of SO₂ was collected on 1 sq cm of the filter, which corresponded to the collection of 0.1 ppm of SO₂ for about 300 hours with a face velocity of 30 cm/sec. No variation of efficiency with humidity was observed for the experimental range of 60 to 82%.

APTIC-23263

ELECTRIC FILTRATION OF SO₂.

Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2 (1):98-100, 1967. Translated from Japanese. 8p. Noriyoichi Adachi, Makoto Kimura, and Seiko Hashimoto.

Identifiers: *Electrostatic precipitators, *SO₂ removal (combustion products), Japan, Stack gases, Sulfuric acid, Sodium carbonate, Water, Flow rates, Corona, Voltage.

To develop equipment for the removal of sulfur dioxide in flue gas, a wet-type electric precipitator was constructed and a basic study of electric filtration of SO₂ was performed. Liquid was dropped along the inside wall of a glass cylinder of 35 mm inner diameter. The corona electrode was placed at the center of the cylinder and voltage was applied between the corona electrode and the liquid surface. A known concentration of SO₂ gas was introduced from the bottom of the cylinder, passed through the corona discharge, and was taken out from the top of the cylinder. Sampling of SO₂ was in accordance with Japan Industrial Standard JIS-K0103-1963; titration was employed for the analysis of SO₂. As SO₂ is an electronegative gas on which electrons are easily attached, its collection efficiency was increased at a corona starting voltage of 5 kV and the efficiency was constant with voltages larger than a certain value. The collection efficiency was always higher with a negative corona electrode voltage than with a positive one. With positive voltage above a certain level, collection was not achieved steadily. A flow rate of about 100 ml/min. was most adequate. Gas collection efficiency was greater than 93% with an applied voltage of 9 kV and SO₂ concentration below 0.45%. In the preceding results, water was employed as the collection medium. Further experiments were conducted using a 5% aqueous solution of Na₂CO₃ and a 10% aqueous solution of sulfuric acid. The collection efficiency was reduced with the increase of SO₂ concentration; this tendency was more pronounced with the sulfuric acid solution. With a voltage of 7 kV, the efficiency with the Na₂CO₃ solution was almost 100%, whereas with the sulfuric acid solution it was only 35%.

APTIC-23264

THE PENETRATION OF GLASS FIBER MEDIA BY AEROSOLS AS A FUNCTION OF PARTICLE SIZE AND GAS VELOCITY. PART 1: NON-RADIOACTIVE AEROSOLS.

Atomic Weapons Research Establishment, Aldermaston (England), Rept. 05/69, 33p., May 1969. 36 refs. CFSTI: AWRE-D-569

J. Dymant.

Identifiers: *Aerosols, *Particle size, *Glass fabrics, Great Britain, Flow rates.

Despite the extensive literature existing on fibrous filtration, the complexity of the problem is such that it is still not practical to predict with any accuracy the performance of a given fiber mat in terms of efficiency versus particle size, particularly in the submicron range. Insufficient information was available concerning the filtration efficiency of fibrous filter materials used in the atomic energy industry for air cleaning. Experimental determinations are made of the penetration of a heterogeneous sodium chloride test aerosol through two different fibrous filter media, a medium efficiency fiber mat and a high efficiency glass fiber paper. The experiments covered particle sizes between 0.04 and 0.5 micron diameter and gas velocities from 2.5 - 50 cm/s. A maximum value for the penetration versus particle size function varied in position from 0.12 micron down to 0.09 micron

with increasing gas velocity. This peak penetration was approximately three times the average test aerosol penetration on a mass basis. The size distribution of the test aerosol is satisfactory for the checking of filter efficiencies. (Author abstract modified)
APTIC-23267

PURIFICATION OF GASES, WITH SPECIAL ATTENTION TO DESULFURIZATION AND THE RECOVERY OF SULFUR.

(Gasreinigung, insbes. Entschwefelung und Schwefelgewinnung). Text in German. Chem. Fabrik., 12 (1, 2):6-23, 1939. 50 refs. (Presented at the Inorganic Chemistry Workshop at the 51st General Meeting of the VDeCh at Bayreuth, June 10, 1938.)
Gerhard Lorenzen.

Identifiers: *By-product recovery, *S₂ removal (combustion products), Charcoal, Germany, Coal tars, Combustion gases, Dusts, Catalytic oxidation, Sulfuric acid, Ammonia, Benzenes, Naphthalenes, Iron compounds, Nitrogen oxides, Sulfur compounds, Pressure.

Gases used as the raw material in the synthesis of other gases contain a number of substances after their manufacture that need to be removed before synthesis can begin, either because these are desired for other industrial purposes or because they would be detrimental to the synthetic process. A rough outline is given of such purification processes, including the more recent developments in the removal of dusts and tars and the recovery of ammonia and benzene. The possibility of the use of pressure is also discussed. Desulfurization is closely examined in the light of the possibilities of recovering sulfur for commercial uses. The dry process, using iron oxides, is especially compatible with pressurizing processes when one uses the Lenz method, with ball-shaped iron ore. The iron ore can also be replaced with activated carbon. Sulfur is recovered by extraction. Among the wet processes, one must distinguish between the neutralization process, which involves washing hydrogen sulfide with alkaline liquids and regenerating the washing liquid with heat, and the oxidation process, in which the H₂S is either reduced to elemental sulfur or converted to the sulfate ion. Oxidation processes include that of Gluud-Still (Thylox), compounding with arsenic, the Staatsmijnen-Otto process, and compounding with Fe (CN)₆ as an oxygen bearer. Ammonium sulfate is formed by combining several processes in which H₂S is oxidized in gaseous form by the use of a catalyst. Among the neutralization processes are those of the Union Chimique Belge, that of Petit and Hultman-Pilo (using organic washing liquids), the Girbotol process, and the alkazide process. The H₂S recovered by the neutralization processes can be converted to H₂SO₄ (Lurgi process) or to elemental sulfur by the improved Claus method. Brief mention is made of nitrogen oxide removal and dehydration and the removal of naphthalene by low-pressure and high-pressure processes.
APTIC-23269

PROCESS OF RECOVERING SULFUR FROM SULFUR-BEARING GASES.

(Du Pont de Nemours (E. I.) Powder Co., Wilmington, Del.) U. S. Pat. 912,743. 4p., Feb. 16, 1909. (Appl. Dec. 3, 1907, 7 claims).
Paul S. Smith.

Identifiers: *By-product recovery, *S₂ removal (combustion products), *Reduction, Combustion gases, S₂ removal (combustion products), Combustion.

A process and required apparatus for recovering sulfur from sulfur dioxide are described. The process involves mixing a water gas with an SO₂-bearing gas, heating this mixture by the combustion of another gas, called the producer gas, thereby causing the mixed gases to react, with sulfur vapor as a reaction product. This process allows the producer and water gases to be manufac-

tured continuously, and it allows them to be led directly into the reaction chamber. Former processes manufactured the producer and water gases alternately, and then sent them to storage chambers where they lost much of their heat energy. By making the changes, the process described improves the efficiency and economy of sulfur recovery.
APTIC-23272

THE IMPORTANCE OF RESIDUAL MASS AND RESISTANCE PROFILES IN AIR FILTRATION.

Preprint, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, Engineering Research and Development Section, 30p., Nov. 1959. 2 refs. David G. Stephan, and George William Walsh.
Identifiers: *Design criteria, *Bag filters, Fluid flow, Stack gases, Dusts.

The design of fabric air filtration equipment for cleaning effluent gas streams and recovery of airborne products is still based primarily on precedent. A possible key to improved design techniques lies in studies of full-scale filters on an incremental area basis. Research in which the magnitude of residual (after cleaning) profile variations on commercial-scale fabric air filter bags was determined is described. The reasons for these variations, the way in which residual profiles are generated, how they evolve as a filter ages, the physical structure of the residual dust cake, and practical implications gained from a knowledge of residual profile characteristics are treated. (Author abstract modified)
APTIC-23292

LIQUEFIED GAS TANKERS.

16p., 1970 (*).

Personal Author Not Recorded.

Identifiers: *Natural gas, *Ships, *Compressed gases, France, Great Britain, Design criteria, Ammonia, Chlorides, Chlorinated hydrocarbons, Ethylene.

Early experiences of several companies involved in the ocean-transport of liquefied natural gas (LNG) are presented. The history of ships designed to transport LNG is traced. Services provided by the Conch Ocean Ltd. company include guidance and supervision during construction of tankers, training personnel, technical studies, and special testing of components. Basic design requirements for the sophisticated transport ships are more stringent for the range -59°C and below than they are for higher temperatures. Some of the principal kinds of design variations are mentioned. The growth of world trade in terms of total number of ships and total capacity is traced. LNG and ethylene transport began in 1964. Other liquefied gases include ammonia, propylene, butadiene, and vinyl chloride.
APTIC-23302

RECOVERY OF AMMONIUM SULPHATE FROM SULPHUR DIOXIDE IN HOT FLUE GASES. (X). EFFECT OF DUST ON THE CATALYST ACTIVITY.

(Ryuan nado o fukusei suru Endohaigasu no jyogaiho. (X). Syokubaiso ni hirai suru dasuto no syokubai kassei ni ataeru eikyo ni suite). Tokyo Inst. of Tech. (Japan), p. 1425, 1969 (*). Translated from Japanese. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 2p., Oct. 28, 1969.

Raisaku Kiyoura, Haruo Kurayama, and Yoshisuke Uenishi.
Identifiers: *Dusts, *S₂ removal (combustion products), *Catalytic activity, Japan, Ammonium compounds, Sulfates, Flow rates, Temperature.

In a desulfurization system designed to recover ammonium sulfate, the possibility of dust passing through the collector system and poisoning the catalyst was investigated. An amount of dust equal to 3, 6, and 12% of the total weight of the catalyst (roughly the amount thought to have collected in a

period of 3 to 12 months) was sprinkled on the catalyst and flue gas was passed over the catalyst at a stack velocity of 3000 and 6000 l/min at a temperature of 350-450°C. No significant effect on the catalyst was observed.
APTIC-23303

REDUCTION OF EMISSION OF POLLUTANTS. RECENT ADVANCES IN ELECTROSTATIC PRECIPITATORS FOR DUST REMOVAL.

Phil. Trans. Roy. Soc. London, Ser. A, 265 (1161):301-307, Nov. 13, 1969. 16 refs.

H. J. Lowe.

Identifiers: *Dusts, *Electrostatic precipitators, Great Britain, Coal, Electric power production, Centrifugal separators, Rapping, Ammonium compounds, Sulfur compounds, Sulfates, Flow rates, Electrical properties, Electrical resistance.

The basic theory of electrostatic precipitation is reviewed and discrepancies between theory and practice are commented upon. A working expression for particle migration velocity based on test data is presented. Three plant developments are discussed: The elimination of cyclone collectors ahead of the precipitator, the trend to almost flat electrodes, and a modest increase in the maximum gas velocity which eases the problem of precipitator volume associated with boiler size increases. A rather unusual complaint is that British precipitator performance is suffering from too low a sulfur content in the effluent gas. Below 1.3% sulfur, the conductivity of the particulates is adversely affected, and about 28% of the currently used coal is below that level. Research is in process to determine the optimum means of adding ammonium sulfate to the exhaust gas to control particulate conductivity. Rapping as a means of cleaning electrodes is analyzed as to force and frequency in the various zones of the precipitator.
APTIC-23305

RECOVERY OF AMMONIUM SULPHATE FROM SULPHUR DIOXIDE IN HOT FLUE GASES (VIII). KINETIC EQUATION FOR THE OXIDATION OF DILUTE SO₂ GAS.

(Ryuan nado o fukusei suru Endohaigasu no jyogaiho (VIII). Kihado SO₂ gasu sanko no hanna sokudoshiki ni suite). Tokyo Inst. of Tech. (Japan), p. 396, 1968 (*). Translated from Japanese. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 2p., Oct. 27, 1969.

Raisaku Kiyoura, Hiroshi Kubota, Haruo Kurayama, Yoshisuke Uenishi, and Masayoshi Ueki.

Identifiers: *Reaction kinetics, *Catalytic oxidation, *S₂ removal (combustion products), Japan, Stack gases, Ammonium compounds, Potassium compounds, Vanadium compounds, Oxides, Sulfates, Catalytic activity.

Oxidation of mixtures of sulfur dioxide (0.1 to approximately 0.4%) and oxygen (1 to approximately 4%) was studied with a V2O5-K2SO4 catalyst, and a kinetic expression was determined for the oxidation. The experimental values are in good agreement with the values calculated from the expression, which assumes that the rate-determining step is the surface reaction 2SO₂ yields SO₂ + SO and that SO₂ is adsorbed on the surface.
APTIC-23307

IMPROVEMENTS IN RECOVERING SULPHUR FROM SULPHURETTED HYDROGEN.

(Assignee not given.) Brit. Pat. 13,844. 3p., April 17, 1897. (Appl. June 23, 1896, 2 claims).

John Brock, and Ferdinand Hurter.

Identifiers: *By-product recovery, *Peter spence process (claus), *Hydrogen sulfide, Great Britain, Combustion gases, Lime, Metal compounds, Sulfur compounds.

Sulfuretted hydrogen gas obtained by decomposition of metallic sulfides, has previously been treated for the large-scale removal of sulfur in one of two ways. Either the sulfuretted hydrogen gas

was mixed with sulfurous acid gas and the mixture passed through water or a saline solution in which the hydrogen of the sulfuretted hydrogen combined with the oxygen of the sulfurous acid to form water and sulfur, or the sulfuretted hydrogen gas was mixed with atmospheric air and the mixture passed through a Claus kiln, where at elevated temperatures the oxygen of the air combined with the hydrogen of the sulfuretted hydrogen to form water and sulfur. A process is described which consists of mixing the gas with sulfurous acid and passing the mixture through a Claus kiln, where the following reaction takes place: $2\text{H}_2\text{S} + \text{SO}_2 \rightarrow 2\text{H}_2\text{O} + 3\text{S}$. The gases are mixed in such a way that for every two molecular proportions of sulfuretted hydrogen there is one molecular proportion of sulfurous acid gas. Inert gases may be present, but it is preferred not to have much oxygen present. If oxygen is present, the proportion of gases must be adjusted so that there will be sufficient hydrogen in the mixture to combine both with the oxygen of the sulfurous acid and with the free oxygen to form water. The preferred source of the sulfuretted hydrogen is the gas obtained by the action of lime kiln gases on alkali wastes. APTIC-23308

ACOUSTIC COAGULATION OF MIST CONTAINING FLUORINE COMPOUNDS. I.

(Акустическая коагуляция тумана, содержащего фтористые соединения. I. Text in Russian. Zh. Prikl. Khim., 34 (1):78-84, 1961, 28 refs.

M. L. Varlamov, Ye. L. Krichevskaya, A. A. Ennan, L. M. Kozakova, and G. A. Manahin. Identifiers: *Mists, *Fluorine compounds, USSR, Chemical processing, Control methods, Phosphates.

Removal of fluorine compounds from mist was increased from 42-69% to 80-95% by inducing acoustic coagulation through application of 16.5-kHz sound at 153-155 dB. Degree of removal was significantly affected by the concentration of the mist; increasing moisture content from 15 to 120 g/cu m upgraded removal from 73 to as high as 95%. With constant moisture content, the degree of removal increased with initial fluorine concentration and with the duration of the sonic treatment. Tests at a granulated superphosphate plant showed precipitation of 87% of the fluorine in exhaust gases after 3 seconds of sonic treatment; fluorine content was reduced from 0.18 to 0.023 g/cu m directly within the sonic-treatment tube without auxiliary mechanical precipitation. APTIC-23310

AN IMPROVED FUME-DESTROYING PROCESS.

(Assignee not given.) Brit. Pat. 18,202, 4p., Feb. 15, 1912. (Appl. Aug. 11, 1911, 2 claims).

Hamilton Sanborn, Henry Gratian McMahon, John Trumbull Overbury, and Stewart Woodford Young.

Identifiers: *Fumes, *By-product recovery, *Absorption (general), Limestone, Stack gases, Primary metallurgical processing, SO_2 removal (combustion products), Calcium compounds, Iron compounds, Manganese compounds, Sodium compounds, Sulfur compounds, Sulfides.

In the process of smelting ores, enormous quantities of sulfur are released in the form of gaseous sulfur dioxide. This gas, when present in considerable quantities, acts as a poison to vegetation and has deleterious effects on man and animals. A practical method for abating the sulfur dioxide nuisance and recovering large quantities of free sulfur entails treating smelter fumes and gases with a suitable sulfide, collecting the solid particles formed by the absorption of the sulfur dioxide, separating the free sulfur from the solids, and subjecting the residue to the action of heat and carbon to regenerate the sulfide for further use. The free sulfur formed by the reaction between sulfur dioxide and the sulfide is recovered by fusion, solution, distillation, or other suitable

methods. Treatment of the residue with carbon at high temperatures reduces the sulfite and sulfate contained in it to sulfide. Because of its inexpensiveness, calcium sulfide is the preferred absorbent. It can be obtained by initially using lime or limestone, which when saturated with sulfur dioxide and sulfur trioxide consists of a mixture of calcium sulfide and calcium sulfate, which is then reduced to calcium sulfide. Other suitable sulfides are magnesium, sodium, or iron. APTIC-23311

FILTRATION OF ATMOSPHERIC AIR.

(La filtrazione dell'aria atmosferica). Text in Italian. Condizionamento dell'Aria Riscaldamento Refrigerazione (Air Conditioning Heating Cooling), 6 (14):215-225, June 1970.

Antonio Briganti.

Identifiers: *Efficiency, *Measurement methods, *Filters, Equipment standards, Italy, Dusts, Electrochemical methods, Photometric methods, Particle size, Odor counteraction.

A classification of relative size, weight, and percentage of particles present in the atmosphere is given. Particles below 1 micron represent 99.9% of the number, although they represent only 30% of the total weight. Methods for evaluating the efficiency of a filter are Air Filter Institute Code Test (based on weight), National Bureau of Standards (calorimetric method), and D.O.P. (numerical or photometric method). Each of these methods is useful to evaluate a single and unique class of filters, characterized by a well-defined field and performance: the AFI, for low efficiency filters; the NBS, for medium efficiency filters; and the DOP, for high efficiency filters. To evaluate the difference among filters with different filtration efficiencies, but obtained with the same method, the index of quality K is introduced, and its expression is given. Two mechanisms of filtration for coarse filters and for very fine filters are presented in addition to a series of elements helpful in evaluating the useful duration of the filter and the mathematical expression of the useful time of a filter (in hours). Physical characteristics of absolute filters, microfilters, and active charcoal filters are indicated. Some microfilters can be constructed with programmed variable filtering efficiency. Charcoal filters (to be used in conjunction with a preceding stage of dust filters) are mainly used to eliminate odors. APTIC-23319

SOME MICROSCOPIC FEATURES OF FLY-ASH PARTICLES AND THEIR SIGNIFICANCE IN RELATION TO ELECTROSTATIC PRECIPITATION.

Atmos. Environ., 4 (2):175-185, 1970, 28 refs.

C. A. J. Paulson, and A. R. Ramsden.

Identifiers: *Fly ash, *Operating variables, *Electrostatic precipitators, Australia, Coal, Particulate classifiers, Particle shape, Particle size, Fuel additives, Humidity, Combustion.

Examination of fly ash samples from five technical-scale tests and one full-scale test of electrostatic precipitation efficiency showed that collection efficiency decreased as the proportion of particles smaller than five microns increased in the fly ash entering the precipitator. When this proportion exceeded 43% by weight, the collection efficiency was unacceptably low (less than 98.5%). Superfine fly ash consisting predominantly of submicron particles was encountered in one test, apparently as a result of the high fusible content of the bituminous coal being burned. Such fly ash was especially difficult to precipitate. Particle shape was another factor influencing efficiency; spherical particles were collected more easily than nonspherical particles. It is suggested that increasing gas humidity might help promote agglomeration of superfine particles and that the addition of fluxing agents to the fuel during combustion could promote the formation of spherical particles. Lengthening particle residence times by increasing turbulence in the furnace might favor formation of larger ash particles. (Author abstract modified)

APTIC-23331

NEW TEST METHOD, CERTIFICATION TO UPGRADE AIR FILTRATION.

For primary bibliographic entry see Field 11.

APTIC-23335

A NEW PROCESS FOR THE REMOVAL OF POLLUTANTS IN GAS OR VAPOR FORM.

(Neues Verfahren zur Beseitigung gas- oder dampfförmiger Luftverunreinigungen). Text in German. Allg. Prakt. Chem. (Vienna), 21 (4):130, April 1970.

Personal Author Not Recorded.

Identifiers: *Filters, *Adsorption, *Catalytic oxidation, Charcoal, Germany, Fumes, Solvents, Design criteria.

Satisfactory methods are available for the removal of either low or of high concentrations of organic vapors from the atmosphere in the form of active carbon filters and catalytic combustion but a gap exists for the removal of pollution within a range of from 1 to 1000 mg/cu m. To fill this gap, a combination adsorption filter-catalytic combustion method has been developed. The equipment consists of a conventional active charcoal filter with a desorption device which both regenerates the inactivated filter and simultaneously disposes of the desorbate by catalytic oxidation. The desorption-oxidation device operates continuously by using the combustion heat and the burnt desorbate for further desorption. The described cylindrical filter has an airstream capacity of 2000 cu m/hr, contains 100 l active carbon, and can absorb up to 20 kg organic material depending on its nature so that at a pollution level of 500 mg/cu m, regeneration is necessary after 200 hours of operation. The regeneration requires practically no power input except for the heating of the enclosed air. APTIC-23337

STEAM ENGINES AGAIN? YES—BUT WITH A NEW APPROACH.

S.A.E. (Soc. Automot. Engrs.) J., 78 (10):36-42, Oct. 1970.

Personal Author Not Recorded.

Identifiers: *Steam engines, *Design criteria, Automotive emissions, Engine exhausts, Carbon monoxide.

A small and efficient steam engine now under development has a rotary expander that produces 76% of the theoretical maximum power and a combustion steam generator only 18 in. in diameter and 11 in. thick. The expander uses pivoting vanes (i.e., arms) which produce less friction than sliding arms. The rotor and arms overlap the expansion impulses imparted to the rotor, and a variable cut-off valve for almost full admission insures that at least two inlet ports are open at all times. Thus the expander will start, and always in the correct position, whenever steam is admitted. The burner in the compact steam generator has a mat of ceramic fiber through which air and gaseous fuel are pumped. A spark plug or glow wire ignites the mixture, after which combustion sustains itself on the inner surface. Flame ionization detector measurements of the emission from the ceramic burner indicate total concentrations of about 200 ppm, mostly carbon monoxide. Performance of the engine is contrasted with General Motor's SE-101 steam car. APTIC-23338

ELECTRONICS IN THE SERVICE OF THE AUTOMOTIVE INDUSTRY: ITS EVOLUTION AND ITS PROSPECTS FOR THE FUTURE.

(L'electronique au service de l'automobile; developement, perspectives, d'avenir). Text in French. Ingrs. Automobile (Paris), 43 (7):389-399, July, 1970.

Günther Baumann, and Hermann Scholl.

Identifiers: *Electronics, *Automotive emission control, *Timed fuel injection, Germany, Automobiles, Instrumentation.

Previous to the development of semiconductor devices, the use of electricity in automobiles was more or less limited to lighting, running the starting motor, and operating signals. The first actual use of electronic devices was the development of AC generators equipped with diode rectifiers. Ignition systems can be improved by electronics in a number of ways, such as by the use of a condenser and/or a thyristor. In 1967 a 'Jetronic' system was developed in Germany. This is an electronically controlled gas injection system, which has possibilities in the area of air pollution control. The year 1966 also saw the introduction of an electronically controlled automatic transmission. An electronic device also permits more effective use of brakes, preventing skids and the locking of wheels. Electronics are also involved in air conditioning and in recent research in a computerized control system. New developments in the field of batteries (and fuel cells) are discussed at length.

APTIC-23343

NINETY NINE POINT NINE PERCENT SULFUR RECOVERY UNVEILED.

Oilweek (Calgary Can.), 21 (32):9-12, Sept. 28, 1970.

Les Rowland.

Identifiers: *Petroleum refining, *By-product recovery, *Sulfur oxides control, *Desulfurization of fuels, Corrosion, Canada, Maintenance, Peter spence process (claim), Cobalt compounds, Molybdenum compounds, Hydrogen sulfide, Catalysts, Hydrogenation, Cooling, Vapors.

Summaries are given of papers which were presented at the Canadian Natural Gas and Petroleum Association quarterly technical meeting in Banff on Sept. 18th. Handicaps to sulfur plant efficiency lie in the water vapor which persists in the reaction products and the relatively inert sulfur compounds, carbonyl sulfide and carbon disulfide, which are formed in the reaction furnace. The Ralph M. Parsons Company has devised a method in which all the sulfur present in the tail gases can be converted back to pure hydrogen sulfide by hydrogenation, under very moderate conditions of temperature and pressure, with the use of a cobalt molybdate catalyst to speed the reaction. The Beavon sulfur removal process is also very effective in reacting water vapor with carbon monoxide to form hydrogen, or reacting water vapor with COS and CS₂ to form H₂S. After hydrogenation and cooling, the tail gas was a very clean stream containing 2-3% H₂S, about 12% CO₂, and the remainder mostly nitrogen. The Stretford process was chosen to remove the H₂S. Brittle or ductile sour gas pipeline failures resulting from corrosion in an H₂S environment were studied by KCM Engineering Ltd. in Calgary. Theory and lab scale work appear to have established that failures in an H₂S environment are the result of reversible hydrogen embrittlement, with the failures a function of stress, time and hydrogen concentration. Pacific Petroleum Ltd. describes its maintenance development program which is based on the concept of stimulating pride in self-development and making it possible for employees to create a future for themselves. A panel discussion was held on how to motivate employees, and Leo Chikinda of Dominion Bridge Co. discussed the do's and don'ts in labor relations.

APTIC-23348

EXHAUST EMISSION IMPROVEMENT OF VEHICLE SPARK-IGNITION ENGINES UNDER VARYING OPERATION.

(Abgasverbesserung bei instationären betriebenen Fahrzeug-Ottomotoren). Text in German. ATZ (Automobiltechnische Zeitschrift) (Stuttgart), 72 (8):283-288, Aug. 1970. 10 refs.

E. G. Zeschmann.

Identifiers: *Carbon monoxide, *Spark ignition engines, *Carburetion, Germany, Engine exhausts, Engine operating cycles, Internal combustion engines, Automotive emission control, Engine operation modification, Testing facilities, Test engines.

The carbon monoxide levels in automobile exhaust emissions were measured under varying operating conditions simulated on a test rig by carburetor adjustments. In the stationary experiments, the minimal throttle valve closing and opening times were chosen to utilize the full lift of the piston. The idling rate was 700 rev/min. To simulate CO emission levels during driving, stationary engine operation was conducted under different constant valve positions. As expected, CO emission increased with increasing stroke frequency. The postulate of minimal CO emission demands a quick closing of the throttle valve with fuel return feed. In contrast, the opening speed of the throttle valve cannot be arbitrary but should be synchronized with the fuel supply. It is difficult for the driver to fulfill this condition. To investigate the effect of a delayed throttle valve opening, various carburetor adjustments were made and the respective CO emission was measured. Results disclosed that fuel return feed by an acceleration pump can reduce the quantity of unburned fuel in engines with frequent load changes which is the case in city driving. The fuel feed should be connected directly with the float chamber.

APTIC-23349

3. MEASUREMENT METHODS

FEASIBILITY STUDY FOR THE DEVELOPMENT OF A MULTIFUNCTIONAL EMISSION DETECTOR FOR AIR POLLUTANTS BASED ON HOMOGENEOUS CHEMILUMINESCENT GAS PHASE REACTIONS. (FINAL REPORT).

Aerochem Research Labs., Inc. Princeton, N. J., NAFCA Contract CPA 22-69-11, Aerochem TP-217, 25p., Sept. 1969. 15 refs. CFSTI: PB 188104 Arthur Fontijn, Alberto J. Sabadell, and Richard J. Ronco.

Identifiers: *Design criteria, *Nitrogen monoxide, *Chemiluminescent detector, Analytical methods, Monitoring, Carbon monoxide, Nitrogen oxides, Nitric oxide (no), Nitrogen dioxide (no), Ozone.

The reactions of common air pollutants, such as nitric oxide, nitrogen dioxide, and carbon monoxide with certain second reactants, such as ozone or O atoms, result in light emission. Measurements of the emission intensity can be used to determine the concentration of the pollutants. In a detector based on this principle, ambient air and the second reactant can be continuously flown through and mixed in a reactor under moderate vacuum. After calibration, a continuous record of the pollutant concentration can be obtained. Specific intensity to a given pollutant is obtained by a suitable choice of the second reactant and a light filter. An experimental study of the device concentrated on the detection of NO, using O₃ as the second reactant. The lack of interference by other common air constituents and pollutants with the response of the NO/O₃ system was established. The detector had a linear response from about 4 ppb NO to at least 100 ppm NO. Based on the experimental results and data for other chemiluminescent reactions, it is concluded that homogeneous chemiluminescence monitors can be developed for O₃, NOx equals NO + NO₂, and CO. (Author summary modified)

APTIC-17430

COMPARATIVE LONG-DURATION TRIALS OF DUST CONCENTRATION RECORDING INSTRUMENTS IN THE FLUE GASES OF BROWN COAL-FIRED POWER PLANTS.

(Vergleichende Dauerbetriebsprüfung von Staubsichtmessgeräten hinter Braunkohlenfeuerungen). Text in German. Mitt. Ver. Grosskesselbesitzern, 49 (1):23-27, Feb. 1969. 7 refs. (Presented to the VGB, Emissions Meet., Munich, 1967).

H. Vetter.

Identifiers: *Transmissometers, *Calibration methods, *Gravimetric method, Germany, Stack gases, Steam plants, Instrumentation.

In three different soft coal-fired power plants, eight dust concentration units measuring the light extinction of three different manufacturers were tested for a period of three months. Gravimetric calibration measurements were taken at the beginning and end of tests. None of the units survived the test period without trouble or failure, and two instruments were entirely replaced after half the test period had elapsed. High deviations between the extinction and gravimetric measurements are explained by the varying grain size distribution of dust, its changing location, temporal changes of its surface properties, shape and density distribution, which consequently change the optical properties, varying water vapor content, and finally a low water vapor dew point. Causes for trouble such as the non-uniform soiling of the transmitter and reflector parts, as well as the formation of flue gas condensate in the transmitter and reflector casings, could be eliminated. The question whether extinction measurements are as reliable for soft coal-fired boilers as gravimetric measurements was not solved by the tests.

APTIC-19047

COMMENTS ON THE USE OF THE ISOINETIC PROBE.

(Remarques sur l'emploi de la sonde isocinetique). Text in French. Informations Aerauliques et Thermiques (Paris), 5 (18):19-22, Sept. 1968.

J. Mion.

Identifiers: *Dusts, *Sampling probes, France, Calibration methods, Experimental equipment.

Isokinetic conditions are achieved when the flow rate of a gas is not modified by its entrance into a dust-sampling probe, which means that a simple zero reading of an isokinetic probe indicates such a condition is fulfilled. Tests of such a probe were conducted at CETIAT, using a nozzle with an outer diameter of 150 mm and inner diameters of 12, 16, and 20 mm to study the range of flow rates between 4 and 20 m/sec. The use of an isokinetic probe simplifies the practical problems involved in measuring the dust content of a gas, but requires careful calibration to avoid the introduction of systematic errors, which can amount to as much as 5-10% under unfavorable conditions.

APTIC-19095

OUTLINE WORKSHOP SESSION E. SULFUR DIOXIDE.

Preprint, California Univ., Berkeley; Public Health Service, Washington, D. C., National Air Pollution Control Administration, 11p., 1970. 14 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30-April 1, 1970.)

Yoshiro Tokiwa.

Identifiers: *Measurement, *Sulfur dioxide, California, Measurement methods, Calibration methods, Experimental equipment, Air quality standards.

Basic data on the chemical and physical properties of sulfur dioxide and its physiological effects are outlined, in connection with its measurement as defined by California air quality standards, which are also stated. Measurement is considered in terms of sample collection, methods, accuracy, and calibration. Brief descriptions are given of the following categories of measurement methods: manual (colorimetric West-Gaeke, acid titration, and colorimetric starch iodide); continuous (conductimetric, colorimetric, amperometric, flame photometric, electrochemical membrane, and spectrometric); and cumulative total (lead peroxide candle, sulfation plate, alkaline plate, and high volume sampler). Data on reagent/absorber, range, sensitivity, and recorder size are presented tabularly for 17 commercial models of continuous SO₂ analyzers.

APTIC-19104

DETERMINATION OF NITROGEN DIOXIDE AND NITRIC OXIDE IN THE PART PER MIL-

LION RANGE IN FLOWING GASEOUS MIXTURES BY MEANS OF THE NITRATE-SPECIFIC ION ELECTRODE.

Anal. Chem., 42 (9):1102-1105, Aug. 1970. 11 refs. Raymond Di Martini.

Identifiers: *Nitric oxide (no), *Nitrogen dioxide (no2), Electroconductivity analyzers, Experimental methods, Nitrates, Ozone, Hydrolysis, Oxidation, Ions.

An analytical technique for the continuous determination of nitrogen dioxide or nitric oxide involves the gas phase oxidation of either compound in air to nitrogen pentoxide by ozone, followed by absorption and hydrolysis of N2O5. Hydrolysis of the nitrogen pentoxide leads to formation of nitrate ion, so the quantitative determination of the nitrogen oxides as nitrate ion is performed with a nitrate-selective ion electrode. Nitrate ion determinations were performed with a NO (3-) selective ion electrode, and typical data are presented in tabular form. The minimum detection limit of the electrode was determined to be 1.4 times 10 to the minus 8th power. The analytical technique described has direct application in the field of air pollution. The range of nitrogen oxide concentrations detected by the electrode is similar to those found in tunnels, terminals, and other similar structures and, possibly, in the lower levels of air. APTIC-19205

ARRANGEMENT FOR INDICATING THE PRESENCE OF IMPURITIES AS WELL AS CONTAMINATION AND POISONOUS SUBSTANCES IN AIR AND GAS.

(Assignee not given.) U. S. Pat. 3,507,622. Apr. 21, 1970. 2 refs. (Appl. June 30, 1967, 8 claims).

Lars-Erik Tammelin, and Arnold P. Antte.

Identifiers: *Colorimetry, *Samplers, *Design criteria, Sweden, Aerosols, Gas sampling, Filters, Absorption, Carbon monoxide.

A device for detecting the presence of impurities and harmful substances in the air or other gases and vapors is described. This device can be used to indicate the presence of chemical or biological weapons in time of war, to detect carbon monoxide in garages and vehicles, and for gas analyses and alcohol tests. It consists of a rotatable disc with radial channels having inlets next to the center of the disc and outlets at the periphery. The inlets contain sorbents, such as filter paper, for absorbing gases and aerosols. Due to the high speed at which the disc rotates, it acts as a pump drawing the sample through the indicator. To indicate the presence of a specific poisonous or contaminating substance, an indicator which shows a color indication should be used during the sampling. If only one substance among a number of possible ones is to be detected, an arrangement is used which consists of a number of indicators for absorbing gases and aerosols. When the samples have been taken, different reagents are applied to the various indicators. It is preferred that the indicator be arranged on a carrier which can be removed from the device. APTIC-19239

QUANTITATIVE ANALYSIS OF METALS BY ATOMIC ABSORPTION IN INDUSTRIAL MEDICINE: I. APPLICATION TO QUANTITATIVE ANALYSIS OF ORGANIC LEAD IN THE AIR OF WORKSHOP ENVIRONMENTS.

(Dosage des métaux par absorption atomique en Médecine du Travail. I. Application au dosage du plomb organique dans l'air des milieux de Travail). Text in French. Arch. Maladies Prof. Med. Trav. Securite Sociale, 31 (3):133-140, March 1970. 1 ref. (Presented at the Societe de Medecine et d'Hygiene Meeting, Feb. 10, 1969.) G. Thilliez.

Identifiers: *Flame ionization detector, *Spectrophotometry, *Lead compounds, France, Continuous monitoring, Design criteria.

The method of quantitative analysis by flame photometry of atomic absorption utilizes the fact that when an atom of a given species in its fundamental state at the energy level E1 collides with a photon of frequency nu, it absorbs this photon and due to the jump of an electron from its subshell into another, passes into an 'excited' state at the higher energy level E2, provided that nu equals (E2-E1)/h, that is, it is a characteristic frequency of that atomic species, h being Planck's constant. The design of such a device is described for continuous monitoring of the concentration of lead as an indicator of the concentrations of the very toxic tetramethyl lead and tetraethyl lead in the air of two shops in which they are produced. It incorporates a T-shaped fused-silica tube formed of a 20 cm long, 2 cm dia vertical segment provided with a water-cooled gas burner at the bottom and a butting at the top on the middle of a 100 cm long, 1 cm dia horizontal segment open at both ends. A mixture of hydrogen and fresh or either kind of contaminated air fed, as desired, to the burner burns with a smokeless flame dissociating into atoms and flows through both halves of the horizontal segment escaping through its ends. Optically focussed light from an arc lamp traverses lengthwise the entire horizontal segment and is optically focused on the inlet slit of a 'Spectralux 1800' spectrophotometer equipped with a 2160-line grating and a 'Graphisplot GKT VAJ' recorder, which measures the intensity of the received light of the wavelength of 283.3 nanometers. The response time of the device is less than 2 minutes, the least measurable lead concentration is 1 microgram per cubic meter. Its stability is demonstrated by the fact that its initial calibration has not required any modifications since the beginning of its use 4 years ago. APTIC-19276

TIME-RESOLVED MEASUREMENT OF DROPLET SIZE AND CONCENTRATION IN CLOUD CHAMBERS.

Brown Univ., Providence, R. I., Div. of Engineering, ONR Contract N00014-67-A-0191-0001, 25p., March 1970. 9 refs. CFSTI, DDC: AD 702735

John E. Cole, III Richard, and A. Dobbins.

Identifiers: *Particle size, *Ionization chambers, Particle counters, Calibration methods, Dispersions.

An optical method for measuring droplet size and concentration in a cloud chamber is reported. The technique is applicable to condensation studies conducted in Wilson cloud chambers. During the growth of the droplets, optical transmission is continuously measured by high-speed electronic equipment at two wavelengths. Interpretation of the resulting transmission versus time curves is made on the basis of Mie scattering theory. The appearance of oscillatory regions in the transmission curves is related to the primary oscillations of the scattering coefficient and indicates the presence of a nondisperse cloud. Two methods of data interpretation are discussed from which absolute values of droplet size and concentration are obtained. Final droplet diameters from 1.75 to 10.4 micron with corresponding concentrations from 1.8 million to 11,500 droplets/cc were measured in a cloud chamber. Because it can be applied with greater confidence than optical image forming techniques, apparatus of the type described is suitable for the absolute calibration of condensation-nuclei counters of various types. APTIC-19401

ATMOSPHERIC AEROSOL SIZE DISTRIBUTIONS. SUMMARY OF RESEARCH.

Preprint, California State Dept. of Public Health, Berkeley; California Univ., Berkeley; Public Health Service, Washington, D. C., National Air Pollution Control Administration, 12p. 1970. 28 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., 1970.) Kenneth T. Whitby, and Benjamin Y. H. Liu.

Identifiers: *Aerosols, *Particle size, *Instrumentation, Urban areas, Mathematical analyses, Lower atmosphere, Meteorology, Research programs.

Results of a 5-year research program for the development of improved instrumentation for the measurement of aerosol size distributions are summarized. Design and/or modifications are reported of an aerosol analyzing system, a mobility analyzer, and an electrostatic aerosol sampler for light and electron microscopic studies. Urban studies are described in which these instruments were used to investigate aerosol size distribution and concentration, vertical distribution, and the effects of micrometeorological variables. Laboratory studies are in progress of aerosols produced by atomization from a spray can of DOP in Freon and from combustion sources such as cigarettes, matches, and auto exhaust; preliminary results are given. The theory of urban aerosol size distribution and concentration is reviewed in detail, including a report of theoretical studies and comparisons of the data with the 'self-preserving' size distribution. APTIC-19402

THE PRECISION ASSOCIATED WITH THE SAMPLING FREQUENCY OF LOG-NORMALLY DISTRIBUTED AIR POLLUTANT MEASUREMENTS.

Preprint, Air Pollution Control Association, New York City, 21p., 1970. 7 refs. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-19, 1970, Paper 70-9.)

William F. Hunt Jr.

Identifiers: *Air quality measurement programs, *Sampling methods, *Mathematical analyses, Data analysis.

Before establishing an air monitoring site, the field investigator must decide which air pollutant (s) he is going to measure and how he will measure them. After he has made these determinations, the investigator is faced with the problem of how frequently he should sample the air in order to characterize an air pollutant for a given time period and area. The question arises: How many days in a given time period should the air be sampled for a given confidence, say 95%, for example, so that the true geometric mean lies within plus or minus 10% of the sample geometric mean? The sampling period could be 1, 2, 3, or more months, or a year. By using formulas that determine the precision associated with the sampling frequency of log-normally distributed air pollutants, the field investigator is able to compare various sampling plans and analyze the interrelationships between the sampling plan, the standard deviation of the logarithms of the air pollution measurements, the population size, and the confidence level. With the formulas, an experimenter can determine the precision of a sampling plan for any level of confidence or period of time he desires. In this particular context, the population size is equivalent to the period of time being studied. All he needs to know is an estimate of the standard deviation of the logarithms of the air pollution measurements or the sample geometric standard deviation. (Author introduction modified) APTIC-19405

ATMOSPHERIC VERSUS GROUND LEVEL SAMPLING FOR DUST DRIFT RESIDUES.

For primary bibliographic entry see Field 05. APTIC-19596

GENERATION AND MONITORING OF GASES FOR INHALATION STUDIES.

National Cancer Inst., Bethesda, Md. and Atomic Energy Commission, Oak Ridge, Tenn., Proc. Conf. Inhalation Carcinogenesis, Gatlinburg, Tenn., 1969, p. 193-205. 21 refs. (Oct. 8-11.) Robert J. Bryan.

Identifiers: *Monitoring, *Gases, Breathing, Analytical methods, Electrochemical methods, Flame ionization detector, Continuous monitoring, Gas sampling, Samplers, Data analysis, Experimental equipment, Experimental methods, Exposure methods, Safety equipment, Spectrometry, Liquids, Temperature.

The use of challenge gases in inhalation studies imposes many of the same requirements on the exposure systems as does the use of gases in other types of environmental or even reaction studies. These may include gas purity, knowledge of composition, flexibility, constancy of generation, and safety. Additionally, there may be requirements for protection of the experimental subjects, such as special temperature and humidity conditions, and compatibility with unusual exposure configurations. Methods of test-gas generation are reviewed, with consideration given to advantages, limitations, and special application. These methods range from the use of pure compressed gases and the gasification of liquids to on-site generation by chemical or electrochemical procedures. Methods and materials for gas handling are described, including the preferred approaches to injection and mixing. Reference is made to differences between large and small systems. Special attention is given to the metering of dosing gas and carrier gas (breathing air). The problem of dosing gas assay is discussed with emphasis given to currently accepted continuous monitoring practices. Factors included are sampling strategy, sample handling, availability and selection of equipment, such as spectrometry and flame ionization, and data processing. (Author abstract modified)

APTIC-19651

IMPROVEMENTS RELATING TO THE REMOVAL OF SULPHUR DIOXIDE FROM GASES.

(Simon-Carves Ltd., Stockport (England) and Metropolitan Borough of Fulham (England)) Brit. Pat. 633,627. 9p., Dec. 19, 1949. (Appl. Aug. 26, 1946, 18 claims).
William Clifford Parker, and Eric William Frederick Gillham.
Identifiers: *Electroconductivity analyzers, *Scrubbers, *Absorption (general), Great Britain, Combustion gases, SO₂ removal (combustion products), Design criteria, Ammonia, Sulfur dioxide, Electrical resistance, Vapor pressure.

A method is provided for use in manufacturing processes in which gaseous mixtures are scrubbed with wash liquors, for the continuous, automatic determination of the excess of acidic or alkaline constituents of a gaseous mixture. In processes for the removal of sulfur dioxide from gases in which it is present at low concentrations, it is essential that the liquor with which the gas is washed should have a low vapor pressure of sulfur dioxide, as otherwise sulfur dioxide may be transferred from the liquor to the gas. Careful control of the composition of the liquor is needed to secure maximum scrubbing efficiency. When ammonia is used for neutralizing the absorbed sulfur dioxide, it is likewise essential that the vapor pressure of ammonia over the liquor should have a low value. Accordingly, the wash liquor is scrubbed by a stream of air saturated with water vapor, and the ammonia or sulfur dioxide stripped from the liquor by the air stream is absorbed in an acid hydrogen peroxide solution. Ammonia causes a reduction and sulfur dioxide causes an increase in the conductivity of the solution, so that the result of an electrical conductivity measurement indicates whether the liquor is liberating ammonia or sulfur dioxide. In the washing of flue gases with ammonia liquor, the presence of sulfur compounds in the gases leaving the washer may be due to either inefficient scrubbing or decomposition of the circulating liquor. Whereas the sum of the two effects would be measured by an instrument analyzing the gaseous effluent, this invention makes it possible to ascertain directly the tendency of the liquor to liberate either sulfur dioxide or ammonia.

APTIC-19652

CHANGES OF CONCENTRATION OF FREE AMINO ACIDS IN PLANTS UNDER THE INFLUENCE OF HYDROGEN FLUORIDE AND SULFUR DIOXIDE.

For primary bibliographic entry see Field 08.
APTIC-19703

EXHAUST GAS DEVICE TESTING - ROAD OR CHASSIS DYNAMOMETER

Preprint, Society of Automotive Engineers, Inc., New York, 8p., 1962. 1 ref. (Presented at the National Automobile Week Congress, Detroit, Mich., March 12-16, 1962, Paper 486K.)
R. T. Van Derveer, and D. L. Hittler.
Identifiers: *Engine exhausts, *Field tests, Automobiles, Measurement methods, Dynamometers.

To investigate the effects of different power-to-weight ratios on the amount of sensible heat in the exhaust, sixteen cars, representing four power-to-weight ratios, were tested over the California Motor Vehicle Pollution Control Board exhaust device evaluation cycle on the road and on a chassis dynamometer. Engine airflow was measured by a Meriam Laminar Flow Element. Exhaust gas temperature was sensed by a calibrated bare-tip ceramic suspended chromel-alumel thermocouple. Carburetor air temperatures were recorded for each mode of the driving cycle, both on the road and dynamometer, by a thermocouple and potentiometer. The test cars were all 1962 models with a minimum of 1000 miles. Each car was ambient soaked overnight on the dynamometer and then the complete California cycle was run as a warmup procedure. Following the dynamometer test, the car was instrumented for the road test portion of the study. The results of the two tests indicate that the engine exhaust heat content is less for dynamometer operation than for comparable road operation. The engine intake air consumption for the dynamometer cycle of operation is less than the comparable road operation. The difference in exhaust heat and/or power absorbed between chassis dynamometer operation and road operation increases as the horsepower-to-weight ratio increases. Increased load settings at 50 mph for dynamometer operation can provide intake air consumption and/or exhaust heat content equivalent to road operation.

APTIC-19755

MARKING THE DEGREE OF AIR SOILING USING POLICHLORVINYL FIBRE FPP-15.

(Oznaczanie stopnia zanieczyszczenia powietrza przy użyciu włókny polichlorowinyłowej FPP 15). Text in Polish. Ochrona Pracy (Warsaw), no. 5:18-19, May 1970.
Jozef Paszkowski.
Identifiers: *Soiling index, *Membrane filters, Europe, Particulates, Dusts, Microscopy, Flow rates.

The principles of determining dust concentration in the air using fibre filter FPP 15 are given. The preparation of the filter is described. In the dust concentration determination, the filter is weighed before and after the use and the volume of the filtered air is considered. The advantages of the filter FPP 15 are discussed. The weight of the sample should be between 2-40 mg when the flow velocity of the air on the filter is 2.5-4 l/sq cm/min (in any case not higher than 10-17 l/sq cm/min). When the fibre sample is wetted in immersion solution, it becomes transparent and the dispersion of dust particles on it as well as number of granules in cubic cm can be determined under the microscope.

APTIC-19798

MZS-1 APPARATUS FOR SULFUR DETERMINATION IN SAMPLES OF LIQUID HYDROCARBON.

(Przyrząd MZS-1 do oznaczania siarki w probkach ciekłych węglowodorów). Text in Polish. Przemysł Chem., 49(5): 287-289, 1970. 6 refs.
Eleonora Zarzecka.
Identifiers: *Hydrocarbons, *Sulfur compounds, *Liquids, *Measurement methods, Europe, Fuel oils, Isotopes.

An isotopic instrument for the quantitative determination of sulfur in liquid hydrocarbon samples is described. The measurement method utilizes the absorption by the hydrocarbon sample of soft x-rays from a radioactive isotope. Irradiation of the sample initiates photoelectric effects in the sample. The coefficient of photoelectric absorption is a function of the atomic number of the absorbing substance. Thus, small quantities of sulfur can be determined in hydrocarbons composed of low atomic number elements (atomic number 1 and 6). The design of the instrument, its application, and measurement technique are described in detail. The results of measurements of sulfur content in samples of fuel oil obtained using this instrument are compared with the results obtained by other methods. The minimum detectable amount of sulfur is 0.1%. The instrument is suitable for use with hydrocarbon samples containing from 0.1 to 3% sulfur.

APTIC-19807

THE STABILITY OF ABSORPTION SOLUTIONS FOR SULFUR DIOXIDE DETERMINATION BY THE WEST-GAEKE METHOD.

Staub (English translation from German of: Staub, Reinhaltung Luft), 29(9): 30-32, Sept. 1969. 9 refs.
CFSTI: TT 69-550029
Erdwin Lahmann.
Identifiers: *Sulfur dioxide, *West and gaeke, Germany, Absorption, Decomposition.

The literature gives different data on the stability of absorption solutions obtained during determination of sulfur dioxide by the West-Gaeke method. One procedure regulation gives a stability of six hours, which is so short that the use of this method is very difficult. A series of tests indicates that the stability of absorption solutions treated by SO₂/air mixtures is at least one day at room temperature. Normal daylight does not affect the stability of solutions, and the presence of nitrogen dioxide affects them only very little. Decomposition of the SO₂/tetrachloromercurate complex begins after only a few hours at a temperature of 40 °C. (Author abstract modified)

APTIC-19963

SPECIFIC SPECTROPHOTOMETRIC DETERMINATION OF OZONE IN THE ATMOSPHERE.

Anal. Chem., 36(3):671-673, March 1964. 17 refs.
Humberto A. Bravo, and James P. Lodge Jr.
Identifiers: *Spectrophotometry, *Ozone, *Ozonolysis, Calibration methods, Chemical reactions.

The ozonolysis of 4,4'-dimethoxystilbene, with the subsequent determination of the resulting anisaldehyde by condensation with fluoranthene, gave a sensitive and selective test for ozone in the presence of all known interfering substances and at levels expected in the atmosphere. The method was calibrated by using Mylar bags of dilute ozone which were measured against neutral potassium iodide. Comparison of this calibration with one obtained using a standard solution of anisaldehyde showed that the yield of the latter in the ozonolysis step was 98%. In 8 liters of air, 1 ppm of ozone can be detected. The use of trifluoroacetic acid and trifluoroacetic anhydride makes the test somewhat unpleasant and slightly hazardous; however, the sensitivity, specificity, and the apparently precise stoichiometry of the ozonolysis step makes the technique extremely attractive for research on polluted atmospheres and on mixed photochemical systems.

APTIC-20389

ELECTROLYSIS WITH FLOWING SOLUTION.

For primary bibliographic entry see Field 06.
APTIC-21445

CONTROL OF ATMOSPHERIC EMISSIONS IN THE WOOD PULPING INDUSTRY. VOLUME 3. (FINAL REPORT).

For primary bibliographic entry see Field 02.

APTIC-21724

REVIEW OF ANALYTICAL METHODS FOR ATMOSPHERIC OXIDANTS MEASUREMENTS. Preprint, California State Dept. of Public Health, Berkeley, California Air Resources Board, Los Angeles, California Univ., Berkeley, Public Health Service, Washington, D. C., National Air Pollution Control Administration, 24p., 1970. 38 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30, 31, and April 1, 1970.) J. A. Hodgeson.

Identifiers: *Analytical methods, *Measurement methods, *Ozone, Oxidants, Operating variables, Chemical methods, Electrochemical methods, Iodometric methods, Colorimetry, Spectrophotometry, Automatic methods, Continuous monitoring, Photometric methods, Manual.

Currently used oxidant measurement methods and instrumentation were surveyed with emphasis on how these techniques meet the requirements of the California air quality standard for oxidants. Available methods were classified as manual laboratory methods, batch techniques to determine long-term exposures, and continuous field methods. The most widely used laboratory procedure is the 1% neutral buffered potassium iodide method for the determination of ozone. This is also the reference method for air quality standards currently being established at the federal and state levels. It is simple and reasonably accurate but suffers from interference from sulfur dioxide, hydrogen sulfide, and carbon dioxide. Due to the instability of the iodine produced, analysis must be completed soon after sampling, and skilled laboratory technique must be applied to obtain good precision at low levels of ozone. Alternative manual methods are attractive but require additional development. Batch methods of ozone determination sacrifice in accuracy to obtain simplicity. The two in current use, bubbler boxes and the rubber cracking method, are adequate for inexpensive survey methods and comparative qualitative data, but that is their limit. Continuous measurement instruments in use today are all based on the potassium iodide reaction and detection of the iodine product by either colorimetric or coulometric principles. They suffer the same interference problems as the manual iodine methods. Also, being based on a wet chemical reaction, their continuous operation presents some problems in maintenance and supply. Several methods under development are not wet chemical. They are continuous real-time systems designed for the specific determination of atmospheric levels of ozone. One of these, a surface ozone monitor utilizing a chemiluminescent approach, has been fabricated and six prototypes are undergoing field evaluation. Specific determination of ozone may also be accomplished by the use of ultraviolet absorption in the 260 millimicron region. A key question as yet unanswered, however, is whether the measurement of atmospheric ozone is a true measure of the atmospheric oxidant level.

APTIC-21835

A MULTI-STAGE, LOW FLOW RATE CASCADE IMPACTOR.

Aerosol Sci., 1 (1):9-15, 1970. 8 refs.

T. T. Mercer, M. I. Tillery, and G. J. Newton. Identifiers: *Cascade samplers, Operating variables, Design criteria, Aerodynamics, Flow rates.

A round jet cascade impactor having seven impaction stages and operating at 50-150 cu cm/min is described. Details of design and operating characteristics are given. Effective cut-off aerodynamic diameters for the first and last stages differ by a factor of about ten. Real wall losses amount to approximately 2%. It is likely that the same basic unit could be used at higher flow rates with larger jet diameters. (Author abstract modified)

APTIC-21926

ANALYSIS OF THE TRACE OF ORGANIC PRODUCTS IN FUEL COMBUSTION FUMES.

(Analyse des traces de produits organiques dans les fumées de combustion de fuel). Text in French. Rev. Gen. Thermique (Paris), 8 (91-92):665-681, July-Aug. 1969. 83 refs.

Georges Le Strat.

Identifiers: *Combustion gases, *Steam plants, *Analytical methods, France, Fumes, Fuel gases, Flame ionization detector, Mass spectrometry, Hydrocarbons.

Since 1963, the problem of qualitative and quantitative analysis of combustion gases has been studied in one of the two 24-burner oil-fired 770-ton/hr-capacity steam generators of the municipal heating plant at Saint-Ouen (Paris, France) for unburned gaseous organic compounds by means of a recording chromatograph (Perkin Elmer, Model F6) equipped with a flame-ionization detector, a digital integrator with printout device and a thermostatically controlled sample heating chamber as well as a mass spectrometer (C.S.F., Type SM100). Every phase of this work is described and discussed in detail, especially the problem of obtaining representative samples of the combustion gas. The finally adopted procedure, yielding reproducible quantitative results, involves the use of a suspension of finely-powdered vegetable charcoal R. P. in distilled water (1 gram in 100 ml) placed in a bubbling bottle cooled by melting ice, through which between 200 and 1000 cu dm of the combustion gas were passed to be partially adsorbed by the charcoal. To separate the adsorbent, the suspension is filtered or, preferably, centrifuged. The humid charcoal is placed, at ambient pressure, into a desiccator containing calcium chloride for 24 hr. For desorption of the organic constituents of the combustion gas, an aliquot fraction of the resulting pulverulent charcoal was placed into a pyrex tube between two pieces of quartz wool. This tube was attached to the inlet of a stainless-steel double-tubing immersed in liquid nitrogen and both were evacuated. After that the pyrex tube was heated very slowly to about 450 C. Finally the double-u tubing was closed and placed into the sample heating chamber of the chromatograph and heated to between 120 and 150 C for analysis; 2g of charcoal are required to analyze at one time the organic constituents present in 0.5 cu dm of combustion gases. A list of 54 different organic compounds identified in combustion gas samples obtained by the above procedure is given. Quantitative determinations of 14 organic compounds cited for illustration yielded concentrations ranging from 2 times 10 to the -5th power to 1.5 times 10 to the -2nd power grams per one kilogram of fuel oil burned.

APTIC-22144

DETECTION AND EPIDEMIOLOGY OF ATMOSPHERIC POLLUTION DUE TO DOMESTIC HEATING PLANTS IN PARIS.

(Detection et epidemiologie de la pollution atmospherique due au chauffage des locaux a Paris). Text in French. Pollut. Atmos. (Paris), vol. 12:33-42, May 1970.

Louis Coin.

Identifiers: *Epidemiology, *Paris, *Domestic heating, *Measurement methods, Area surveys, Survey methods, Children, Health statistics, Mortality, Stack gases, Gas sampling, Sulfur dioxide.

A review of the activities of the Laboratory for hygiene of the City of Paris in the fields of air pollution and mortality statistics since the year 1874 to the present time, is presented. Early work related to pollution of city air by germs of various diseases and its correlation with increased incidence of these diseases. In 1900, the effect of travel in congested metro trains on the propagation of tuberculosis was scrutinized. Systematic air-pollution measurements in a network of air-sampling stations were begun in 1957 as a result of the notorious smog disaster in London in 1952. On the basis of data collected in 1957 and 1958, it was estimated that about 52% of the air pollution by sulfur dioxide in Paris was due to domestic heating plants

numbering about 20,000. Information is presented on graphic representation of air pollution data by spots of different colors and diameters located at the sampling-station sites, by iso-pollution curves, by echinograms and by iso-exposure time, required for certain toxic effects to become manifest. A time sequence of an iso-exposure time graph is shown. The idea of using the absenteeism of kindergarten-age children as an indicator of the effect of air pollution on the health of a segment of the population is mentioned. A very sensitive indicator of the biological effects of air pollution is deformation of the cell structure in a cytotoxic atmosphere, a technique originated (in 1964) and developed by the Laboratory of Hygiene of the City of Paris.

APTIC-22152

AN INSTRUMENT FOR THE DIRECT MEASUREMENT OF PARTICULATE MASS.

Aerosol Sci., vol. 1:111-114, 1970. (Presented at Un colloque international sur les atmospheres polluees, Paris, France, Nov. 27-28, 1969.)

Raymond L. Chuan.

Identifiers: *Suspended particulates, *Impingers, Measurement methods, Particulate classifiers, Design criteria, Flow rates, Electrical properties.

An active impactor is described which measures directly the mass of air-borne particulates impinging on it, producing, in real time, data on total particulate mass concentration and particulate mass distribution. The device, the key element of which is a thin disc of piezo-electric crystal coated with an adhesive layer, requires an air flow of 0.1 l/sec to yield particulate mass concentration down to 1 microg/cu m. It can resolve individual particulate mass to 10 to the minus 11th power; and measures smaller particles by integrating their impacts. (Author abstract modified)

APTIC-22163

PARAMETERS INVOLVED IN THE SPECTROSCOPIC MONITORING OF ATMOSPHERIC CONTAMINANTS IN THE TUNGSTEN-INERT GAS ARC PROCESS.

Appl. Spectry., 24 (5):526-529, 1970. 7 refs.

E. L. Grove, and W. A. Loseke.

Identifiers: *Welding, *Spectrometry, *Gases, Operating variables, Hydrogen, Oxygen.

The parameters involved in the spectral monitoring of atmospheric contaminants such as hydrogen or oxygen gases in the tungsten-helium arc process were studied under welding conditions. An internal standard was necessary because small variations in arc length, current, condition of metal surface, alloy, the portion of the arc in the aperture and so forth, resulted in relatively large variations in spectral response, proportionally much greater than for those same parameters in conventional low current-graphite electrode spectroscopy. Only the argon line internal standard was satisfactory. Warping of the work metal caused the arc to change in space, so a side arm mount for the torch was designed to carry the entrance optics. The high and varying background that resulted from electrode reflections, glowing oxide particulate, focus on hot metal, and possible radiation from the electrode tip required the use of a rotating circular wedge to oscillate the emission lines across the exit slits. Alternating current electronics amplified the difference in signal levels. (Author abstract modified)

APTIC-22167

MEASUREMENT OF DUST AND EVALUATION OF RESULTS.

(Fujikin no sokutei to suchi no hyoka). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 7 (6):19-33, March 1, 1970.

Keiichi Konno.

Identifiers: *Dusts, *Measurement methods, Japan, Particle size, Density.

Techniques for measuring the properties of powdery dusts are discussed along with measurement results. These particles are formed by the cohesion of microscopic particles in molecular condition. While the dusts can be evaluated according to components, particle size, or density, their appraisal has usually been limited to density measurements. All three factors should be examined, even though it is important to determine the density of particles (5 microns and under) likely to condense on the lungs. Measurements of powdery dusts are carried out directly in the 'floating' method and indirectly in the 'collecting' method, each of which is approved by Japanese Industrial Standards.

APTIC-22328

PESTICIDE RESIDUES IN THE TOTAL ENVIRONMENT: RELIABLE DETECTION AND DETERMINATION, MITIGATION, AND LEGISLATIVE CONTROL AND SURVEILLANCE PROGRAMMES.

Pure Appl. Chem., 21 (3):355-376, 1970. 16 refs.

Francis A. Gunther.

Identifiers: *Legislation, *Pesticides, *Analytical methods.

During the past few years much has been learned about modes of introduction of pesticide chemicals into all niches of the human environment, and their nature and distribution in various substrates. There can be no question that all widely used pesticides have become broadly dispersed from the points of initial pest-control applications, yet it is only recently that widespread concern over the probable ecological sequelae and more immediate effects on man and his food supply has arisen. This concern is now abundantly justified, for many modern pesticide chemicals are long-lived under almost all environmental conditions. Metabolic and other alteration products associated with aged pesticide residues within plant and animal tissues and soils are presented tabularly. Published books containing pesticide residue information are listed, as well as research laboratories in the U. S. prior to 1940. Numerous massive efforts have been undertaken, or are being contemplated, in several countries to evaluate both quantitatively and qualitatively the probable significance of both short and long-term contamination of foods and feeds, soils, waters, aquatic habitats, forests, range-lands, fiber-producing plants, wildlife, rain, snow, air, and people. Analytical contributions are basic to these efforts, but their value is directly proportional to their reliability; either falsely negative or falsely positive residue characterizations and measurements could adversely influence conclusions and decisions about this global problem and its future mitigation. Many legislative bodies around the world recognize the absolute necessity to control both the nature and the amount of pesticide residues in food and feeds. Some of these also recognize that uncontrolled use of certain pesticide chemicals can have consequences on and in the environment that are far more serious than a momentary hazard from excessive residues in a particular crop or crop product. (Author abstract modified)

APTIC-22338

OBSERVATION POST FOR THE TESTING AND CALIBRATION OF INSTRUMENTS FOR THE MEASURING AND RECORDING OF DUST AND GAS EMISSIONS IN A POWER PLANT USING BITUMINOUS COAL.

(Messstand fuer die Pruefung und Kalibrierung von registrierenden Staub- und Gasesageraeten in einem steinkohlengefeuerten Kraftwerk). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 33:77-94, 1970. 11 refs.

Hermann Schnitzler, Otto Maier, and Klaus Jander.

Identifiers: *Dusts, *Measurement methods, *Calibration methods, Germany, Boilers, Coal, Electric power production, Colorimetry, Monitoring, Particle counters, Gas sampling, Particulate sampling, Electrostatic precipitators, Infrared spectrometry, Ultraviolet spectrometry.

Construction and use of an observation post behind the coal-fired generator boiler of a large power plant are reported. Accommodations are such that 4 dust-measuring devices and 4 gas measuring devices can be tested simultaneously. The plant is equipped with an especially good electrofilter, and the average dust content of the purified exhaust gas during normal operation is about 100-150 mg/cu Nm. Among the instruments tested are the Durrum D-R 110, the Sick RM 3g (dust density measurements); the Konitest, which measures dust content; a Beta dust meter, which measures by way of beta-ray absorption. Two types of apparatus for measuring sulfur dioxide content by means of infrared radiation were the URAS, made by Hartmann and Braun, and the UNOR, manufactured by Malhak. Devices using ultraviolet light are the OKOMETER (by Witthof) and UVAMETER (by Bran and Luebbe). Devices using chemical reactions for SO₂ measurement are the Microgas MSK (Woesthoff) and the Color ADOS gas analyzer (Adco), a continuously operating colorimeter.

APTIC-22342

EQUIPMENT OF AND RESULTS HITHERTO OBTAINED BY THE SAMPLE MEASURING STATION IN FRANKFURT/M.

For primary bibliographic entry see Field 04.

APTIC-22360

MEASUREMENT OF SMALL-ION CONCENTRATIONS.

J. Geophys. Res., 75 (24):4491-4498, Aug. 20, 1970. 11 refs.

Niels Jonassen.

Identifiers: *Potentiometric methods, *Ions, Europe, Electric charge.

The concentration of atmospheric ions with mobilities above a given value (for example, small ions) can be measured by using a cylindrical capacitor with a segmented electrode where the difference between the segment currents weighted with their reciprocal effective lengths is proportional to the concentration. An experimental arrangement based on this principle is described. The capacitor is furnished with an electrostatic shield to compensate for effects of stray fields. The weighted current difference is measured by a differential electrometer and can be directly recorded. Concentrations can be measured with an accuracy varying from 2.5 to 5%. (Author abstract)

APTIC-22363

STUDY OF A MICRODYNAMOMETRIC METHOD FOR MEASURING THE CONCENTRATION OF AEROSOLS.

(Etude d'une methode microdynamometrique pour la mesure de la concentration des poussières). Text in French. Aerosol Sci., vol. 1:77-109, 1970. 19 refs.

M. Benarie, and J. P. Quetier.

Identifiers: *Microdynamometric aerosol detector, *Aerosols, France, Particle size, Particulate sampling, Samplers, Design criteria, Electrical properties.

The microdynamometric aerosol detector is a variable condenser formed by a stainless steel foil blade and the conducting detector body. The 10 micron thick blade is aerodynamically stabilized very close to the grounded electrode. Under the impact of particles brought to near sonic velocities in a nozzle, the foil moves slightly and causes a change in capacitance. Depending on the relative dimensions of the blade and the nozzle, especially the length-width ratio of the latter, it is possible: (1) to bring almost all the particles to the same velocity and thus have an instrument which is independent of particle size between 1 and 20 micron diameter. In this case, the detector is a sensing device with an output nearly proportional to the mass concentration, from 15 mg/cu m on. (2) to accelerate the particles selectively in a relatively short nozzle, thus obtaining a response which is particle size dependent. If the mass concentration

is otherwise known (by the simultaneous use of another sensor operated by mode 1 above), then the mean mass diameter (at known or assumed form of the distribution) may be inferred. With a RMS voltmeter as indicating instrument, this simple and inexpensive aerosol sensor forms a stable detecting system which is readily adaptable to extreme climatic conditions (high temperatures, pressures, and so on). The theoretical principles underlying the operation of this sensor are briefly explained. (Author abstract modified)

APTIC-22408

SPECTROPHOTOMETRIC DETERMINATION OF SULFUR DIOXIDE.

Anal. Chem., 42 (11):1282-1285, Sept. 1970. 15 refs.

Amir Attari, T. P. Igialaki, and Bruno Jaselskia.

Identifiers: *Sulfur dioxide, *Spectrophotometry, Phenanthrenes, Iron compounds, Ions, Temperature.

Micro amounts of sulfur dioxide are commonly determined by the West-Gaeke and modified colorimetric methods. While these methods are quite sensitive and specific, they require very close controls to achieve satisfactory precision. An alternative method for SO₂ determination is the spectrophotometric method of Stephens and Lindstrom. This method is based on the reduction of iron (III) by sulfur dioxide in the presence of 1,10-phenanthroline and the subsequent formation of tris-1,10-phenanthroline iron (II), Fe (II)phen₃ (2+). This method yields satisfactory results when the reaction is carried out at 50°C. The amount of Fe (II)phen₃ (2+) varies not only with the amount of SO₂ but also with the temperature. The present investigators modified the Stephens-Lindstrom method by introducing acetate ion for the formation of a labile iron (III) acetate phenanthroline and also elucidated the stoichiometry of the reaction at various temperatures. Determinations of as little as seven micrograms and as much as 150 micrograms of SO₂ per 25-ml were carried out with 1-cm cells and with 4-cm cells in flow systems as low as 2 micrograms of SO₂. The relative precision of the modified method is 1 to 3%. The results, which are presented in tabular form, show that absorbance is proportional to the concentration of SO₂.

APTIC-22411

MODIFIED GAS ANALYZER FOR AIR ANALYSES.

Lab. Pract. (London), 19 (7):716, 727, 1970.

G. N. Balani.

Identifiers: *Textile manufacturing, *Colorimetry, Asia, Sulfur dioxide, Sulfur compounds, Sulfides, Carbon disulfide, Hydrogen sulfide.

Standard colorimetric methods for determining carbon disulfide, hydrogen sulfide, and sulfur dioxide in the atmosphere of a viscose plant depend, respectively, on the interaction of diethylamine and copper acetate mixture, lead acetate in the form of an impregnated filter paper, and an ammoniacal zinc nitroprusside. An improved gas analyzer for such sampling permits simultaneous determination of the contaminants, is easily operated by one individual, and has an improved pumping system.

APTIC-22412

TWO OR THREE EXAMPLES OF PUBLIC NUISANCE DUE TO BAD-ODOR.

(Akushu kogi chosa no nisan no jirei). Text in Japanese. Akushu No Kenkyu (Odor Res. J. Japan), 1 (1):28-36, April 20, 1970.

Yasuyuki Hoshika.

Identifiers: *Odors, *Food and feed operations, *Odorimetry, Japan, Urban areas, Chemical processing, Gas chromatography, Spectrometry.

In Japan, the number of complaints against obnoxious odor has rapidly increased. Broadly speaking, this is not due to the rapid increase of sources but

to increased public awareness. People's consciousness of interest in noxious odors has increased since the air pollution, water pollution, or noise became big issues. Noxious odor was not well defined, and it is still difficult to define the odor nuisance. The range of the odor sources has become extremely large. Urbanization has developed a great deal. Techniques and funds for odor prevention are lacking. As a starting point of odor prevention, a survey was made of factories emitting noxious odors. A processing factory for fish entrails and bones and a pharmaceutical plant were chosen for this purpose. The survey consisted of a questionnaire and odor test. The test included organoleptic tests, such as the odorless chamber method ASTM injector method, and Kinoshita method, and instrumental analyses, such as gas chromatography, ultraviolet, visible, and infra-red spectroscopy, mass spectroscopy, and nuclear magnetic resonance. By correlating these two sets of data, organoleptic and instrumental, the measurement of odor pollution can be quite reliable. Analysis and discussion of the data obtained are given.

APTIC-22431

DETERMINATION OF MICROCONCENTRATIONS OF PARA-NITROANILINE IN THE ATMOSPHERE IN THE PRESENCE OF AMINO AND NITRO DERIVATIVES OF BENZENE.
For primary bibliographic entry see Field 06.
APTIC-22529

DETERMINATION OF INDENE IN THE AIR BY MEANS OF A PHOTOELECTROCOLORIMETRIC METHOD.

(Opredeleniye indena v vozdukh fotoelektrikolokolimetriceskimi metodami). Text in Russian. *Gigiena i Sanit.*, no. 6:51-53, 1970. 4 refs. T. I. Gavrilova, and L. A. Tyurina.
Identifiers: *Indene, *Colorimetry, *Photometric methods, Ussr, Hydrocarbons.

Colorimetric determination of indene as 1-benzal-3 (alpha-oxybenzyl) indene formed in a 3:1 ethanol-dioxane solution is described. This method is capable of detecting indene in amounts of 0.5 micrograms but is not suitable for use in the presence of methylene derivatives of indene, or cyclopentadiene.

APTIC-22541

AN AUTOMATIC SWITCH-VANE TO A STATIONARY INSTALLATION FOR COLLECTING MAXIMAL ONE-TIME SAMPLES OF THE ATMOSPHERE.

(Avtomaticheskii vlyuchatel' flyugarka k stacionernoy ustanovke dlya obora maksimal'nykh razovykh prob atmosfernogo vozdukh). Text in Russian. *Gigiena i Sanit.*, no. 6:47-50, 1970. 3 refs. R. Ya. Maslovskiy, and A. I. Shustov.
Identifiers: *Intermittent monitoring, *Aspirators, *Automatic switch-vane, Ussr, Sampling methods, Winds.

A wind vane designed to restrict operation of a standard aspiration sampler to periods when air flow is from the direction of a selected emission source is described. Associated switching electronics are line operated, and the device is responsive to wind speeds of 1 m/sec and above.

APTIC-22542

SPECTROPHOTOMETRIC DETERMINATION OF ACROLEIN IN THE ATMOSPHERE BY MEANS OF A THIOSEMICARBAZIDE REAGENT.

(Spektrofotometricheskoye opredeleniye akroleina v atmosfere s reagentom tiosemikarbazidom). Text in Russian. *Gigiena i Sanit.*, no. 5:63-65, 1970. 2 refs. M. D. Masita, and E. Kh. Goldberg.
Identifiers: *Spectrophotometry, *Acrolein.

A selective method capable of detecting acrolein in amounts of 0.02 mg/cu m in a 20-liter air sample taken over a 40-minute interval is described. Acrolein is measured spectrophotometrically as the thiosemicarbazone derivative.

APTIC-22543

ACCURACY OF MEASURING AEROSOL CONCENTRATION WITH PARTICLE COUNTERS.

J. Colloid Interface Sci., 33 (4):628, Aug. 1970. 1 ref. David Rimberg, and D. Keafer.
Identifiers: *Aerosols, *Particle counters, *Light scattering.

Monodisperse polystyrene and polyvinyl-toluene latex aerosols were used to check the accuracy of two light-scattering single-particle counters in measuring the number concentrations of particles greater than or equal to 0.5 micron in diameter. One of the two particle counters was set for the size ranges 0.5-5 microns and greater than or equal to 5 microns. The other was set for greater than or equal to 0.5 microns. A comparison of the ratios of the number concentrations given by each counter with the number concentrations obtained from Millipore filter sampling shows that optical counters set at greater than or equal to 0.5 micron are inaccurate for measurements of particles smaller than 1.0 micron. Possible explanations for this result may lie in the optical system of the counters. If the illumination of the optically sensitive volume is not uniform, some of the pulses generated by a monodisperse aerosol traversing a light beam at different points may be too small to register. Even if uniform, the pulses may not be detected if the photocathode surface is not uniformly sensitive.

APTIC-22630

AIR MONITORING: HOW MUCH IS ENOUGH?

For primary bibliographic entry see Field 12.
APTIC-22638

PREPARATION OF GLASS FIBER FILTERS FOR SULFURIC ACID AEROSOL COLLECTION.

Environ. Sci. Technol., 4 (9):769-770, Sept. 1970. 5 refs. Sydney C. Barton, and Henry G. McAfee.
Identifiers: *Sulfuric acid, *Aerosols, *Sampling methods, *Glass fabrics, Canada, Filters, Alcohols, Acetone.

When using glass fiber filters for sampling air containing microgram quantities of sulfuric acid, close attention must be given to blank effects since the residual alkali content of the filters can result in H₂SO₄ losses of 0.4 to 7.8 micrograms per sq cm of filter. In a new procedure, the sulfur contaminants responsible for the irreversible absorption of H₂SO₄ on the filter are deactivated by soaking the filter in 20% H₂SO₄ for two to three days, then rinsing it in distilled water, 80% isopropanol, and acetone. No H₂SO₄ losses have been observed in filters treated in this manner.

APTIC-22645

MEASUREMENT ON AIR POLLUTION DOSAGE TO HUMAN RECEPTORS IN THE COMMUNITY.

Environ. Res., 3 (3):218-233, July 1970. 31 refs. Morton Corn.
Identifiers: *Air quality measurement programs, *Body burden, *Measurement methods, Survey methods, Suspended particulates, Research methodologies.

Speculation on different types of human responses to pollutants will serve to highlight the inadequacies of both current air pollution dosage-response data and community air monitoring networks. There is a desperate need for studies of simultaneous combined action of pollutants on human subjects in the laboratory or in the field. Grab samples

of 1 minute's duration are meaningless for a pollutant that will have its action based on a long biological half-time; similarly, long-term samples for rapidly acting pollutants will also mislead because effects are based on peak values. Perhaps the most difficult air pollutant to associate with a body burden or biological half-time is suspended particulate matter. There is evidence that the same polynuclear aromatic hydrocarbons can have different biological half-times in the lung if the particulate matter on which they are adsorbed have different physical properties. If guidelines could be found and accepted for siting instruments in a community, there would be a basis for comparing air pollution statistics related to a population dose-response. Unfortunately, in the monitoring of pollution in the U. S. we have not differentiated between siting of detection instruments to discover the distribution of air pollution within a community and siting to determine the dosages to which the population is exposed. The Nashville Study is cited to reveal the magnitude of the sampling problem. Alternative purposes of monitoring community air are discussed, as well as air basin models.

APTIC-22652

SO GOES SO₂.

Ind. Res., 12 (9):70-72, Sept. 1970. Frank Cabot.
Identifiers: *Sulfur dioxide, *Alerts, *Netherlands, *Monitoring, Area surveys, Control programs, Air pollution episodes, Europe, Industrial areas, Electrochemical methods, Filters, Computers, Data handling systems, Air pollution forecasting, Stability (atmospheric), Bromine compounds.

Because the Philips sulfur dioxide monitoring system uses a network of strategically placed sensors throughout an industrial region, computers can integrate the many readings and pinpoint the specific source of pollution to predict potential air pollution episodes. Since increasing the stability of the air enhances the probability of a nuisance, if the local weather forecast anticipates continuation of the prevailing meteorological conditions for at least six hours, an external alert is called, and a closed radio-circuit alerts the various industries. A densely populated, highly industrialized area situated between the harbor of Rotterdam and the North Sea, known as the Rijnmond area, was chosen for the first regional network. Each sulfur dioxide sampler is based upon the coulometric technique in which the measurement of SO₂ is accomplished by titration with bromine. Air is introduced through a heated glass fiber to remove dust, and a scrubbing filter removes ozone, hydrogen sulfide, halogen compounds, and other substances. At a speed of about 150 ml/min, the air is fed through the measuring cell containing an aqueous solution of potassium bromide, Br₂, and sulfuric acid. Two electrodes measure the reduction/oxidation potential originating from the Br₂, while the generating current which converts bromide ions into free bromine, determines the output signal, thus measuring the SO₂ concentration in the air. Data on SO₂ concentrations and wind direction is transmitted to a central computer over telephone lines. Further details are described of the Rijnmond network principle.

APTIC-22656

PARTICLE SIZE ANALYSIS BY THE METHOD OF MUSGRAVE AND HARNER.

Ceram. Bull., 49 (9):794-796, Sept. 1970. 16 refs. Clifford C. McMahon.
Identifiers: *Photometric methods, *Turbidimetry, *Particle size, Turbidimetry, Particulate sampling.

A simple theory of the turbidimetric method of particle size measurement is discussed with special reference to the work of Musgrave and Harner, whose calculations are corrected and simplified, making the method even more suitable for quality control work. The theory considers the ef-

fact on the output of a photovoltaic cell of the projected shadow area of particles in a beam of light falling on it, but does not depend on the action of an equivalent hiding factor. Extinction coefficients are included to allow for the fact that for small sizes the shadow projected area of a particle is not proportional to its diameter.
APTIC-22659

AUTOMATIC COUNTING AND SIZING OF PARTICLES.

Ind. Chem., 39 (2): 69-74, Feb. 1963. 47 refs.
P. Connor.

Identifiers: *Particle counters, *Particle size, Great Britain, Aerosols, Automatic methods, Experimental equipment, Light scattering.

Although the development of automatic methods for particle size analysis is still in a comparatively early stage, techniques employed are many and diverse. Already they have been applied with varying degrees of success in industrial process control, research and development, and health physics. Automatic machines based on planar field scanning, while ambitious in purpose and design, have not yet fulfilled early expectations and, although they may be applied with great advantage to certain specific problems, their general lack of flexibility is a disadvantage. Further improvements are needed before these machines can be regarded as general utility instruments. Planar field methods also require the isolation of particles from their original environment and thus may yield information which is not strictly relevant to the system under study. The Coulter counter and sizer can be used for direct particle analysis; the counter's simplicity, wide flexibility, and comparatively low capital and operating costs make the instrument an obvious choice for those applications within the size range specified by the technique. Light scattering methods are readily amenable to automation and at present offer the only reliable means of directly analyzing aerosols over a range of sizes extending from molecular dimensions to the lowest size size. (Author summary modified)
APTIC-22691

THE SPECTROPHOTOMETRIC DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS. SURVEY OF THE ATMOSPHERE OUTSIDE OF ROME.

(La determinazione spettrofotometrica degli idrocarburi policiclici aromatici. Ulteriori rilievi nell'atmosfera di Roma). Text in Italian. Nuovi Ann. Igien. Microbiol. (Rome), vol. 17:383-414, 1966. 23 refs.

P. Valori, A. Grella, C. Melchiorri, and N. Vescia.
Identifiers: *Spectrophotometry, *Aromatic hydrocarbons, *Polynuclear compounds, Italy, Engine exhausts, Column chromatography.

Determination of polycyclic aromatic hydrocarbons in polluted air samples is usually carried out by absorption spectrophotometry after chromatographic separation on column. A detailed analysis of the whole technique is given, and a few devices for spectrophotometric determinations by the baseline technique are proposed. This is used to eliminate mutual interference of the various compounds and to reduce background absorption. Results of the determination of polycyclic aromatic hydrocarbons in polluted air samples collected in Rome during 1965 and 1966 are given. A preliminary analysis on gasoline-powered engine exhaust shows the validity of the method proposed. The spectra registered after chromatographic separation are very similar to those obtained with the polynuclear compounds in the pure state. (Author abstract)
APTIC-22693

PARTICLE SIZE ANALYSIS.

B.C.U.R.A. (Brit. Coal Util. Res. Assoc.) Gaz., 34 (5):120-126, May 1970. 24 refs.
R. F. Littlejohn.

Identifiers: *Particle size, *Particulate sampling, Great Britain, Photometric methods, Sieve analysis, Sedimentation.

Refinements in particle size analysis techniques are discussed, and techniques are compared in terms of groups. Improvements in sieving techniques are directed mainly towards increasing speed and extending the lower size limit. Progress in other types of mechanical sizing, sedimentation, and inertia is mainly in the field of data interpretation. Recent work in optical methods of sizing is concerned with the application of lasers to techniques based on forward scattering of light. Electrical sizing is more or less synonymous with the Coulter method whose speed and convenience have led to its widespread use. Theoretical comparisons of sizing methods are usually based on the assumption that all particles are spheres. Discrepancies in the different methods are revealed and discussed. Choice of size analysis technique for any practical application is governed by the factors of convenience and correlation between the indicated size and a process variable.
APTIC-22830

THE EFFECT OF OSCILLATORY COMBUSTION ON THE FORMATION OF ATMOSPHERIC POLLUTANTS.

For primary bibliographic entry see Field 01.
APTIC-22835

A STABILIZED INTEGRATING NEPHELOMETER FOR VISIBILITY STUDIES.

Atmos. Environ., 4 (2):219-223, 1970. 5 refs.
J. B. Rae, and J. A. Garland.

Identifiers: *Light scattering, *Turbidimetry, Great Britain, Visibility.

Measurement of the atmospheric scattered light can be often related to visibility. An instrument is described which will measure the scattered light coefficient in a small volume of the atmosphere within 10% over a dynamic range of three decades. A value is obtained in digital form every 20 sec which can be integrated over a number of measurements. The instrument is stabilized against variations in the light source intensity and photometer gain. The instrument, called a nephelometer, has an accuracy which is mainly limited by uncertainty in the exact value of the scattering coefficients for the calibration gases over the range of wavelength of the instrument. (Author abstract modified)
APTIC-22846

DEVELOPMENT OF A PIEZOELECTRIC MICROBALANCE FOR CONTINUOUS MEASUREMENT OF AEROSOL MASS CONCENTRATION. (FINAL REPORT).

Thermo-Systems, Inc., St. Paul, Minn., NAPCA Contract CPA 22-69-83, 36p., May 1970. 7 refs.
CFSTI: PB 193362

John G. Olin, Gilmore J. Sem, and Dale L. Christenson.

Identifiers: *Piezoelectric microbalance, *Aerosols, Portable, Automotive emissions, Continuous monitoring, Source sampling, Electrostatic precipitators.

A piezoelectric aerosol particle mass concentration monitor is described. The instrument detects, with high time resolution, the actual mass concentration of an aerosol cloud. It uses an electrostatic precipitator to deposit aerosol particles directly onto a piezoelectric quartz crystal microbalance. The electrostatic precipitator has an advantage over impaction collection devices because it collects the total mass of most aerosols on the crystal surface. The complete instrument is compact, allowing hand-carrying for fast, on-site measurement of particle mass loadings. Typical atmospheric particle mass concentrations (100 micrograms/cu m) are measured with 5% error in less than 10 seconds. The instrument achieves 100% collection efficiency at a flow rate of one

liter/min for corona currents of approximately 3 micro-amps, or greater. Applications include automobile emissions monitoring, industrial hygiene measurement, and source monitoring. (Author abstract modified)
APTIC-22892

APPLICATION OF ELECTRON MICROSCOPY TO THE STUDY OF PULVERIZED COAL COMBUSTION AND FLY-ASH FORMATION.

J. Inst. Fuel (London), vol. 41:431-434, Dec. 1968. 7 refs.

A. R. Ramsden.

Identifiers: *Fly ash, *Sampling probes, *Electron microscopy, Australia, Coal characteristics, Pulverized fuels, Source sampling, Combustion.

A brief description is given of a probe and sampling technique for collecting particles from the gas stream of a pulverized-coal-fired test rig for direct examination by transmission electron microscopy without any intermediate stages of sample preparation. The samples were collected with a water-cooled probe located in a region of the combustion chamber where the gas temperature was about 1000 C. The probe consists essentially of three coaxial stainless steel tubes: the outer tube is a water-cooled jacket, the inner tube carries a sampling grid and a Pt/Pt-14% Rh thermocouple, and the intermediate tube acts as a carriage for the inner tube, which can be withdrawn to change the sampling grid. A light but adequate deposit may be obtained with a sampling time of 2 sec; 10 sec is about the upper limit. With a short sampling time, a quenching effect permits molten particles to be collected. Initial experimental observations made during combustion of some New South Wales bituminous coals are presented, including reproduction of magnified samples. The techniques described, together with electron diffraction studies of the inorganic crystalline constituents, are being applied to studies of combustion of pulverized-coal particles and fly-ash formation, which in turn are expected to be of value in relating the physical properties of residual fly-ash to the efficiency of electrostatic precipitation.
APTIC-22909

PRELIMINARY RESULTS OF THE USE OF INFRARED-COLOR FILM IN AUSTRIA FOR THE PURPOSE OF DETERMINING SMOKE DAMAGE.

(Erste Ergebnisse ueber die Verwendung eines Infrarot-Farbfilmes in Oesterreich fuer die Zwecke der Rauchschaedensfeststellung). Text in German. Zentralblatt fuer das gesamte Forstwesen, 85 (2):65-79, 1968. 8 refs.
Josef Pollanschuetz.

Identifiers: *Plant damage, *Photographic methods, *Infrared radiation, Europe, Fungi, Smokes.

Various plant and tree species, when damaged by smoke or fungi, lose their infrared reflectance. This fact is utilized to detect damaged areas using infrared sensitive colored film for aerial photography. A rapid and objective determination of both damaged area limits and extent of damage can be made. The agent of damage cannot be identified directly from the photograph; however, during the comparative interpretation on the ground, forest protection experts can detect the causal relationships between damage symptoms and agents. Results achieved with Ektachrome-Infrared-Aerofilm in both narrow and aerial formats are discussed, and some specifications and handling techniques are given for the special features of the film.
APTIC-22913

CONSTRUCTION, EQUIPMENT AND TASKS OF A MEASURING VEHICLE FOR ASCERTAINING THE IMMISSION AND EMISSION OF

THE COMPONENTS OF EXHAUST GAS FROM COMBUSTION MOTORS.

(Aufbau, Einrichtung und Aufgaben eines Messfahrzeuges zur Ermittlung von Immission und Emission von Abgasbestandteilen aus Verbrennungsmotoren.) Text in German. Verkehrsmed. Grenzgebiete, 15 (8): 525-545, 1968. 27 refs.

W. Prietsch, N. Jaskulla, and E. Huenigen. Identifiers: *Area surveys, *Survey methods, *Mobile, *Engine exhausts, Germany, Industrial areas, Internal combustion engines, Smoke shade, Automatic methods, Monitoring, Meteorology, Lead compounds, Carbon dioxide, Carbon monoxide, Nitrogen dioxide (no2), Sulfur dioxide.

A mobile air pollution test station especially for the recording of exhaust gas components of motor vehicles is described. The station is employed to determine the air pollution caused by combustion motors in city streets and congested industrial areas, in halls, garages, tunnels, and in open-cast mining. The equipment also enables the carrying out of emission measurements. A fundamental task of the station is the compilation of data for the clarification of the connections between emission and immission. On the basis of that data, toxicological-economical limits for the permissible emission of injurious substances by motor vehicles can be legally fixed. The station measures carbon monoxide and dioxide, nitrogen dioxide, smoke density, sulfur dioxide, and lead. During the measurement of immission, meteorological data are recorded. (Author abstract modified) APTIC-22927

A RECOMMENDED FLAME IONIZATION DETECTOR PROCEDURE FOR AUTOMOTIVE EXHAUST HYDROCARBONS.

Preprint, Society of Automotive Engineers, Inc., New York, 10p., 1970. 24 refs. (Presented at the Society of Automotive Engineers, Mid-Year Meeting, Detroit, Mich., May 18-22, 1970, Paper 700468.)

D. Maxwell Teague, E. J. Lesniak Jr., and E. H. Loeser.

Identifiers: *Hydrocarbons, *Engine exhausts, *Flame ionization detector, Operating variables, Continuous monitoring, Design criteria, Instrumentation, Flow rates.

Test results are given of an investigation to determine 'optimum' sampling and operating parameters of the conventional flame ionization analyzer (FID) so that it could be used for the continuous analysis of hydrocarbons in automotive exhaust emissions. The FID instrument operating parameters appear to offer the best combination of response speed, uniform response to all hydrocarbons, and minimum oxygen interference. These parameters include sample flow, 6 cc/min; fuel flow (40% H₂ + 60% He), 122 cc/min; and diffusion air flow, 220 cc/min. The error due to oxygen interference is less than 1% over the range of 0-24% oxygen. Under these conditions, the FID analyzer follows transients, such as the California cycle, at least as well as the standard NDIR hydrocarbon analyzer. The nearly uniform response of the FID to all hydrocarbons is much superior to the NDIR instrument. The greater sensitivity of FID analysis at low hydrocarbon concentrations is also well known. A FID analyzer can provide adequate response speed and accurate hydrocarbon analyses of automotive exhaust. This requires a slight modification of commercial instruments and adherence to specific operating conditions. Helium is preferred to nitrogen as the instrument fuel diluent. A brief review of current information on FID hydrocarbon analyzers and references covering earlier work and a description of the instrument changes and the recommended analysis system are presented in appendixes. (Author conclusions modified) APTIC-22928

SIMPLIFIED DUST SAMPLING APPARATUS FOR USE IN IRON- AND STEELWORKS.

J. Iron Steel Inst. (London), vol. 206, part 12: 1188-1193, Dec. 1968. 7 refs.

J. H. Flux, D. J. Smithson, and R. N. Smithson. Identifiers: *Dusts, *Primary metallurgical processing, *Sampling probes, Iron, Steel, Great Britain, Fumes, Particle shape, Particle size, Source sampling, Design criteria, Flow rates, Temperature.

The development of a simple but reliable probe which operates within a gas duct or stack is described. Although designed to meet the specialized requirements of iron- and steelworks, the equipment and techniques could find applications in other industries. The entire apparatus, which is schematically illustrated, can be passed through a two-in. bore valve and the probe fitted with a sleeve to screw into a standard piece of pipe. When not required for sampling, the pipe is plugged to ensure that the sampling point remains gas tight. The sampling of dust and fumes in gases is divided into four basic states: gas velocity and temperature measurements; dust loading determination; particle size analysis; and particle shape analysis. The dust loading measurements are required to obtain an assessment of the weight of solid to be collected by the proposed gas cleaning plant. Particle shape and size analyses are essential to ensure that the correct type of unit is employed. Velocity measurements are made with pitot tubes, while the temperature of the gas is measured by an appropriate thermocouple and galvanometer. Gas volumes are recorded by a Rotameter and stopwatch, except when fluctuations in flow are experienced. Then a dry gasmeter is used to integrate the total flow. Dust load is determined in a long straight section of pipe upstream and downstream. Particle size is analyzed with the Alpine jet sieve (for sizes down to 20 micron m) or the Coulter counter (for the range 1-50 microns m). Particle shape is examined with an electron microscope. APTIC-22934

DETERMINATION OF ETHYLENE GLYCOL AND EPICHLOROHYDRINE IN AIR.

(Oznaczenie glikolu etylenowego i epichlorohydrynu w powietrzu metoda z kwasem chromotropowym.) Text in Polish. Ochrona Pracy (Warsaw), 18 (57): 93-108 1968. 21 refs. Aleksandra Krynska.

Identifiers: *Colorimetry, *Alcohols, *Ethylene, *Chlorinated hydrocarbons, Europe, Formaldehydes, Oxidation, Temperature.

Ethylene glycol and epichlorohydrine in air can be determined by oxidizing them with periodic acid to formaldehyde. The formaldehyde is determined colorimetrically by the chromotropic method. The effects of reagent concentration, time, and temperature on oxidation and coloring were studied. As a result of these studies, of variants of improving the method, which result in higher accuracy and a shorter operating time, are described. The sensitivity of this method is one microgram for ethylene glycol and two micrograms for epichlorohydrine in a 1 ml sample. (Author summary modified) APTIC-22951

THIN-LAYER CHROMATOGRAPHY OF PEROXY COMPOUNDS.

J. Gen. Chem. (U.S.S.R.), Eng. Translation from Russian of: Zh. Obshch. Khim., 37 (4): 720-721, April 1967. 3 refs.

A. N. Sorokina, A. E. Batog, and M. K. Romantsovich.

Identifiers: *Thin-layer chromatography, *Peroxides, Ussr, Aluminum oxides.

Peroxy compounds can be identified and separated by thin-layer chromatography, which provides a means for selecting separation conditions, confirming the homogeneity of the peroxides, and characterizing them by their R_f values.

Chromatographic analyses were conducted for some peroxy compounds containing t-alkyldioxy groups on a thin layer of unbound alumina. Hydroiodic acid with hydrochloric acid vapor was used for development. The method of ascending chromatography in an unbound layer of alumina was used. There is a clearly expressed relation of R_f to the structure of the peroxy compound. The lowest mobility is exhibited by t-alkyl hydroperoxides. A sharp increase in mobility is observed by replacing the hydrogen atoms by an alkyl or a t-alkyl group. The introduction of an ester group into an alkyl-enebis lowers R_f relative to the unsubstituted diperoxide. For all the peroxy compounds studied, the mobility increases with change in the peroxy group along the series: t-butylidioxo, t-pentylidioxo, t-hexylidioxo. The R_f values for 32 peroxy compounds in various solvents are given. APTIC-22956

ODOR INTENSITY AND ODOR TRAVEL FROM INDUSTRIAL SOURCES.

Intern. J. Air Water Pollution (London), vol. 7: 71-78, 1963. 4 refs.

Henry C. Wohlers.

Identifiers: *Thresholds, *Odorimetry, *Transport, Stack gases, Odors, Petroleum refining, Kraft pulping, Food and feed operations, Printing, Stacks, Mathematical analyses, Diffusion, Plume behavior, Turbulence (atmospheric).

Odor surveys were completed of stack effluents and in the vicinity of a petroleum coking plant, a kraft-paper mill, an onion and garlic dehydrating plant, and a retrograve printing plant. Gas samples were taken by the evacuated bulb technique or by passing sufficient stack gas through a bottle to replace the original air in the bottle. Threshold measurements were made with an osmoscope consisting of two telescoping metal tubes complexly arranged for odor dilution with clean air. The odor intensity in the environs of the industrial plant was determined subjectively while driving in a car at constant speed (30-35 mph) with the wind-wing of the driver's window open so that the oncoming air was directed at the face of the observer. When the extent of the odor travel from these plants was compared with the calculated threshold dilution of the stack gases according to Sutton's equation, the odor measurements at the stacks did not agree in all cases with the calculated dilutions at the distances in the field where the odors were noted. Unless the diffusion coefficients are experimentally determined, the Sutton equation should not be used for distances greater than 2 miles; at distances greater than 1 or 2 miles under unstable conditions, the stack height, the exit velocity, and the temperature of the exhaust gases no longer seriously affect the plume axis concentrations. The osmoscope, which assumes the validity of the Weber-Fechner law, had an error of no larger than about 25%. The consequence of the logarithmic relation of this law is that a 10-fold reduction in odor concentration makes a scarcely perceptible alteration in the strength of the odor. This relation must be considered in making field odor surveys. It is suggested that these results are another example of only partially diluted stack gases moving as discrete eddies through the atmosphere. (Author abstract modified) APTIC-22958

MEASUREMENT OF POLYCYCLIC AROMATIC HYDROCARBONS IN THE AIR OF SYDNEY USING VERY LONG ALUMINA COLUMNS FOR SEPARATION.

Intern. J. Air Water Pollution (London), vol. 7: 753-767, 1963. 18 refs.

Graham J. Cleary.

Identifiers: *Column chromatography, *Polynuclear compounds, *Sydney, Australia, Urban areas, Spectrophotometry.

A technique for analysis of the polycyclic content of airborne particulates in Sydney is presented, which employs 23 by 0.5 in. diameter alumina

columns. Air-particulate samples numbered from eighty to one hundred and forty, and fractions in cyclohexane were graphed separately on a ratio recording ultraviolet spectrophotometer. The order of elution was nearly constant, but unknown factors in rare instances reversed the order of adjacent compounds. An elution sequence graph is included, as well as a tabular presentation of the wavelength maxima of polycyclic compounds in cyclohexane. A library of standard substances was compiled, allowing solutions of known concentration to be graphed. Quantitative measurements were made using the Beer-Bouguer law and a local baseline technique. Polycyclic hydrocarbon levels for sampling locations in the inner city area and at two suspect sources of emission are reported. Results conform to a reasonable pattern on the basis of the 3,4-benzpyrene/coronene ratio alone. APTIC-22964

CONCENTRATION OF TRACE METALS BY SOLVENT EXTRACTION AND THEIR DETERMINATION BY ATOMIC ABSORPTION SPECTROPHOTOMETRY.

Environ. Sci. Technol., 4 (9):749-751, Sept. 1970. 9 refs.

Sham L. Sachdev, and Philip W. West.

Identifiers: *Metal compounds, *Spectrophotometry trace analysis, Carcinogens, Spectrophotometry, Trace analysis, Aluminum compounds, Beryllium compounds, Cadmium compounds, Copper compounds, Iron compounds, Lead compounds, Nickel compounds, Silver compounds, Zinc compounds.

Conditions are described for extracting various metal ions into an 8-quinolinol-ethyl propionate solution. By combining dithionite, oxinate, and acetyl acetate extractions into ethyl propionate, as many as ten different metal ions (Ag (+), Al (2+), Be (2+), Cd (2+), Cu (2+), Fe (2+), Ni (2+), Pb (2+), and Zn (2+)) can be concentrated by a single extraction step for subsequent determination by atomic absorption spectrophotometry. As determined by a study of the interference effects of 34 diverse ions and compounds, the procedure is highly selective. With the exception of aluminum, all the metals can be determined at the ppb level in an aqueous solution. Sensitivity for aluminum is 0.1 microgram per ml. The procedure is well suited for environmental studies because it includes the majority of the inorganic carcinogens. (Author abstract modified) APTIC-22975

THE ADVISABILITY OF USING CHROMATOGRAPHY TO DETERMINE UNBURNED GASES.

Thermal Eng. (English translation from Russian of: Teploenergetika, 16 (12):53-57, 1967. 19 refs.

O. N. Degtev, and G. M. Karagodin.

Identifiers: *Combustion gases, *Chromatography, *Mathematical analyses, Ussr, Coal, Fuel gases, Fuel oils.

The loss due to unburned gases is determined by analyzing flue gases with a GKhp-3 or VT-2 apparatus, or with chromatographic or titrimetric gas analyzers. The choice of method is governed by the required accuracy of determination as well as by the minimum loss reliably recorded. Errors in determination result from errors in gas analysis, in calculating flue gas volume, and in calculating the calorific value of the fuel. Expressions are derived for calculating the errors of determination for the different gas analyzers and for establishing with adequate reliability the recorded minimum value of the concentration of components under determination. Allowable errors of determination are also calculated for different types of fuel. Based on a comparison of these values with the errors of determination by the different methods, the preferred analyzer for each type of fuel is determined. Use of a chromatograph is recommended for anthracites and coals. APTIC-22982

PRESENT STATE OF AIR POLLUTION AND ITS CONTROL POLICY IN FRANCE.

(Furansu no taikosen no genjo to sono taisaku nitsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuic. ncs), 6 (8):477-489, Aug. 25, 1970. 12 refs.

Kusuo Tsuji.

Identifiers: *Carbon monoxide, *Sulfur dioxide, *Legal aspects, *France, Legislation, Regulations, Japan, Automotive emissions, Dusts, Measurement methods, Samplers.

Efforts of the government of France to control air pollution, related regulations which have been currently issued, some personal comments on the recent development of air pollution control in both France and Japan, and major apparatus or equipments that facilitate control activities are presented. It is noted that the people and government of France are concerned with environmental protection rather than the 'effect of air pollution on human health' emphasized in Japan. This indicates that air pollution control policy is more advanced in France. Some related regulations in effect are: the law dealing with 'Dangerous, unsanitary, and unpleasant facilities' effective 1917, the 1961 revision of the same with respect to human life, industrial development and public sanitation, the 1963 government ordinance empowering the governor to protect the citizens from air pollution, the 1963 departmental ordinance dealing with inspection of all the facilities responsible for gas discharge and penalty for violation, and the 1964 departmental ordinance dealing with smoke dust and gas emission control. Some regulation on motor vehicles emission is included in the 1963 departmental ordinance. The main pollutant of Paris is carbon monoxide from motor vehicles, and strict traffic regulations along with intensive monitoring activities are in practice. APTIC-22991

INTERNAL REFLECTION SPECTROSCOPY APPLIED TO AIR POLLUTION.

Atmos. Environ., 4 (2):125-128, 1970. 4 refs.

Frank M. Noonan, and Benjamin Linsky.

Identifiers: *Asbestos, *Infrared spectrometry.

Five internationally standardized samples of types of asbestos were identified by multiple internal reflectance spectroscopy in the infrared region between 650 inverse cm and 4000 inverse cm. Previously, identification of asbestos types has required personal visual recognition through light microscopy, electron microscopy, or electron microprobe techniques. Samples used in this investigation were undiluted, uncontaminated masses of large sized asbestos fibers less than 200 micron in length, similar to refined production material. Lower limits of resolution as to mass, fiber length, and dilution with other air pollutants will next be determined, along with methods of atmospheric sample preparation, such as a slow ashing method. (Author abstract) APTIC-22995

MERCURY SUBSTITUTION-NUCLEONIC DETECTION INSTRUMENT FOR SULFUR DIOXIDE MEASUREMENT.

ISA (Instr. Soc. Am.) Trans., 9 (1):9-16, 1970. 1

ref. (Presented at the Instrument Society of America, Analysis Instrument Division, National Symposium 15th, May 6, 1969.)

R. J. Pfeifer, B. Y. Cho, and O. L. Utt.

Identifiers: *Sulfur dioxide, *Mercury substitution nucleonic detection, *Stack gases, *Monitoring, Intermittent monitoring, Adsorption, Mercury compounds, X-rays.

In the future, stack gas monitors for sulfur dioxide may be required to demonstrate compliance with federal regulations, and such monitors may become integrally associated with control systems such as scrubbers. For application in power plants and heat-generation facilities, a potential stack-gas monitor must be reliable and easily maintainable, reasonably accurate and free from errors due to contaminants, and of simple construction. The

Gas sampling procedure must be such that sulfur dioxide in the gas under test is not altered by sampling conditions. A sulfur dioxide measuring instrument based on a mercury substitution and nucleonic detection (MSND) technique provides these four desirable features. The instrument is characterized by a stoichiometric substitution of mercury for sulfur dioxide in a reaction cell, transfer of the mercury to a measurement cell, and measurement of the mercury by low-energy X-radiation absorption. Construction of the instrument is simple and the disposable reaction cell is charged with reagents for 10-day operation. Measurement accuracy is excellent due to the stoichiometric substitution which is unaffected by interfering substances. Since the mercury substitution occurs in an aqueous medium, the gas sample need not be freed of water vapor and particulates. Total response time, as determined by the sizes of reaction and measurement cells and fluid flow rate, is approximately 15 min. APTIC-22998

MEASUREMENT OF MALODOUROUS GAS BY GAS CHROMATOGRAPHY.

(Gasukuromatogurafu ni yoru akushu gasu no sokutei). Text in Japanese. Akusho no kenkyu (Odor Research J. Japan), 1 (1):16-27, April 20, 1970.

Tooshikazu Ohkita, and Masao Watanabe.

Identifiers: *Odors, *Gas chromatography, *Odorimetry, Japan, Air quality measurements, Gas sampling, Filters, Instrumentation, Amines, Organic sulfur compounds, Mercaptans, Infrared radiation.

Either qualitative or quantitative measurement of an odorous gas by conventional methods are extremely difficult because of its low density and because it is frequently a mixture of several kinds of different gases. Also, the intensity of the odor is affected by human factors and environmental conditions such as humidity or temperature. Scattering of data is observed in the detection threshold, but very little in recognition threshold values. Gas chromatography is employed in the analysis because normally odorous gas is a mixture of gases, each component of which can be analyzed by the method. Also, the development of high-sensitivity detectors, such as flame ionization, electron capture, coulometric, and flame photometric detectors, contributed to more use of the gas chromatograph. Experimental procedures of the methods such as calibration for amine, mercaptan, and organic sulfide, and gas collections by cooled organic solvents, filtration with reagents, and powder surface cooled by liquid oxygen are described. Field measurements are also presented together with the method of gas collection at the source. The application of gas chromatography for the qualitative analysis of excretal smell is given in detail. Several methods of gas collection, including organic solvents and U-tube cooled by liquid oxygen, are described together with gas chromatogram and infra-red spectrum. APTIC-23004

THE THERMAL PRECIPITATOR.

Univ. Durham, King's Coll., Mining Bull., 9

(23):9p., 1947 (?). 2 refs.

Personal Author Not Recorded.

Identifiers: *Thermal precipitator, Occupational health, Pneumoconiosis, Great Britain, Dusts, Particle counters, Particulate sampling, Microscopy.

The thermal precipitator, an instrument which samples with high accuracy all kinds of airborne particles, is of the greatest value in assessing the dust content both qualitatively and quantitatively in mines and factories. Standards of permissible dustiness have been published, applicable to conditions under which pneumoconiosis cases could continue in employment. Dust particles are deposited by thermal means on thin microscope cover-glasses where they adhere by molecular attraction and require no subsequent fixing. Particles are counted and sized on the stage of a high

power, high resolution microscope. The instrument consists of two main parts, the head, carrying a heated wire, and the aspirator which draws the air past the heated wire. Two brass blocks, separated by thin strips of insulating material, are screwed together to form the head; the wire is attached to one end of a spring which keeps it taut as it expands on heating. The volume of the sample taken should be such that the number of particles counted in any one strip should not be less than 50 or more than 200.
APTIC-23066

AN AUTOMATIC PHOTOELECTRIC CONDENSATION NUCLEUS COUNTER.
Proc. Roy. Irish Acad., Sect. A, 68 (3):33-39, Oct. 1969. 10 refs.
E. I. Hayes, and J. A. Scott.
Identifiers: *Particle counters, Ireland, Automatic methods, Photometric methods, Calibration methods, Instrumentation, Condensation, Nucleation.

A detailed description is given of the construction of an automatic photoelectric condensation nucleus counter based on the original 1946 counter of Nolan and Pollak. The fog tube of the modified counter is fitted with four normally closed solenoid valves, opened by energizing the solenoids, which replace the taps of the original instrument. Control is achieved by solid state timing units. Calibration checks over a wide range of nucleus concentration showed that average percentage difference between the concentrations as measured by the new and original counters was less than 3%, which is within the range of agreement between even two Nolan-Pollak counters. In performance, the modified instrument has proven very reliable over long periods under both laboratory and field conditions.
APTIC-23011

A CONTINUOUS RECORDING VISIBILITY METER FOR AIR POLLUTION STUDIES.
Stanford Research Inst., Calif., 25p., 1953 (?). 9 refs.
C. W. Marynowski, and F. E. Littman.
Identifiers: *Visibility, *Continuous monitoring, *Photometric methods, Design criteria, Experimental equipment.

For the present application of a continuous recording visibility meter, 'local' visual range was defined as that range which would exist if the atmosphere and illumination in the immediate vicinity of the observer extended uniformly to the horizon in all directions. The standard practice of assuming a constant liminal contrast ratio of two percent for instrumental measurements of visibility was adopted; such an 'instrumental visibility' is dependent only on the properties of the atmospheric aerosol (if the spectral distribution of the illumination does not vary), since factors affecting the discriminating ability of the human eye are eliminated. The instrument described consists essentially of a photoelectric photometer aimed at a dark target, photovoltaic cell exposed to an 'artificial horizon', and a modified Leeds and Northrup Micromax. Optical theory for the instrument and its operation is discussed, as well as its measuring circuit, graduation of the recorder chart, and performance of the instrument.
APTIC-23016

ASSESSMENT OF THE COLORIMETRIC METHODS OF DETERMINATION OF CHROMIUM IN AIR AND URINE BY MEANS OF RADIOISOTOPE TECHNIQUES.
Acta Pol. Pharm. (English translation from Polish of Acta Pol. Pharm.), 26 (2):168-176, 1969. 5 refs.
CFSTI: TT 69-50004/2
Tadeusz Dutkiewicz, Jerzy Konczalik, and Maria Przechers.
Identifiers: *Chromium compounds, *Colorimetry, Urinalysis, Europe, Radiation measuring systems, Absorption, Isotopes, Water.

An evaluation of the colorimetric methods of determining chromium in air and urine based on the reaction of Cr (6+) with diphenylcarbazide was carried out, using radioisotope techniques as the comparative method. Recovery of chromium from solid absorbers is not complete because of the reduction of Cr (6+) to Cr (3+) and may be a source of errors in analysis. It is recommended to do the washing-out with cold water and, simultaneously, to carry out the calibration of the method from the moment of introduction to the absorbers the known quantities of chromium. Oxidation of chromium in urine samples occurs with the same yield, irrespective of the quantity of chromium. The colorimetric method of chromium determination in urine is of the same order as aqueous solutions, and therefore is suitable to the hygienic investigations for the evaluation of exposure to chromium compounds under industrial conditions. (Author abstract modified)
APTIC-23040

THE APPLICATION OF A PULSED-LIGHT RANGEFINDER (LIDAR) TO THE STUDY OF CHIMNEY PLUMES.
Phil. Trans. Roy. Soc. London, Ser. A., 265 (1161):153-172, Nov. 13, 1969. 20 refs.
P. M. Hamilton.
Identifiers: *Lidar, *Plume behavior, Great Britain, Stack gases, Lasers, Ground level.

Lidar observations, depending on the detection of backscatter from a pulse of light by particles along its path, have been used to study chimney plumes and their environment. Important technical improvements to the basic equipment include the use of swept gain and the development of a brightness modulated display. A number of examples of lidar scans through plumes are presented to demonstrate the value of the improved display. Lidar observations of plumes over periods of about an hour were used to predict ground-level concentrations of pollutants. In neutral conditions, the predictions were significantly better than predictions based on meteorological data alone. Observations of the rise and growth of a plume suggest that, in the equation of motion describing the rise of a plume element, the rate of change of upward momentum should be equated to about one-half rather than the whole of the buoyancy force. Finally, a technique is outlined for analyzing the vertical profiles of aerosol concentrations in the lower layers of the atmosphere. These profiles often reveal features that are vital to a full understanding of plume behavior. (Author abstract modified)
APTIC-23049

ADDITIONAL STUDIES OF POLYCYCLIC HYDROCARBONS IN CIGARETTE SMOKE. (COMPARISON OF ASPIRATED SMOKE AND THAT COLLECTED FROM ROOM AIR).
(Ulteriori ricerche sugli idrocarburi policiclici del fumo di sigaretta. (Confronto tra il fumo aspirato e quello raccolto nell'aria ambiente). Text in Italian. Boll. Soc. Ital. Biol. Sper. (Naples), vol. 37:769-771, 1961. 5 refs.
G. Scasellati Sforzolini, and G. Saldi.
Identifiers: *Smoking, *Polynuclear compounds, Italy, Analytical methods, Samplers.

Following up some earlier research, experiments were conducted with a view to standardizing the aspiration of smoke by a machine, so as to approach as closely as possible the normal conditions experienced by the human smoker. Polycyclic hydrocarbon content in the smoke aspirated by the machine was to be determined, and smoke dispersed into the air of the room during the intervals when the smoke was not being aspirated was to be collected and analyzed. Aspiration periods were established—relying upon data from the literature—at 2 seconds, separated by 60-second intervals. Cigarettes were burned to a stub length of 1.5 cm. A total of 200 cigarettes were used. Results confirmed data reported by other authors, documenting the presence of polycyclic hydrocarbons, in quantities not to be ignored, in the air of the room, which are emitted in the intervals between 'puffs' of the smoker.

APTIC-23064

METHODS OF EVALUATING THE BACTERIAL SEEDING OF ATMOSPHERIC AIR.
Lab. Delo, no. 3:164-168, 1968. Translated from Russian by J. Sechovicz, Foreign Technology Div., Wright-Patterson AFB, Ohio, Translation Div., 7p., Feb. 20, 1970. CFSTI, DDC: AD 704014
S. I. Kudryavtsev, and N. I. Tonkopy.
Identifiers: *Bacteria, *Aerosols, *Sampling methods, USSR, Samplers, Design criteria, Winds, Flow rates.

The possibilities of using bacteria-collecting equipment for estimating the bacterial seeding of atmospheric air at various air movement speed were examined and a device for precision isokinetic aerosol sampling was developed. Results of studying the effectiveness of the bacteria-intercept devices at various air velocities in a wind tunnel are summarized in tabular form. The majority of the devices were unsuited to isokinetic sampling, since aerosol particles precipitated on the end-face of the tunnels of the intake sections of the devices. This shortcoming is eliminated in a sampler having tubes with chamfered edges, a clamping device for filters, and whose capture of aerosol particles is a function of the position of the inlet apparatus in relation to the direction of wind movement in the tunnel. Collection efficiencies for particles of different dispersities are tabulated.
APTIC-23069

DETERMINING THE CONCENTRATION OF OIL AEROSOLS IN THE AIR OF INDUSTRIAL INSTALLATIONS BY THE GRAVIMETRIC METHOD WITH THE AID OF FPP-15 FILTERS.
Gigiena Truda i Prof. Zabolevaniya, 8 (2):53-55, 1964. Translated from Russian. Foreign Technology Div., Wright-Patterson AFB, Ohio, Translation Div., 5p., Jan. 30, 1970. CFSTI, DDC: AD 704209
V. A. Lutov.
Identifiers: *Lubricants, *Aerosols, *Sampling methods, *Filter fabrics, USSR, Analytical methods, Chemical methods, Filters.

Of necessity, high-speed methods for the cold working of metals by cutting involve the use of lubricating oils that, in the course of operations, form high-dispersion oil aerosols. Filters made of FPP-15 fabric are used to gather air samples for gravimetric determination of the concentration of the oil aerosols. The effectiveness of these filters was tested in industrial installations and compared with that of cotton filters and the fluorescent method. The concentration of oil aerosols measured by the FPP-15 filters was 36.5 mg/cu m; by the cotton filters, 23.9 mg/cu m; by the fluorescent method, 34.9 mg/cu m. The degree of dispersion of oil aerosols was as follows: up to two micron, 87%; from two-five micron, 13%. Successful application of the FPP-15 filters requires that aerosol concentrations by analyzed not later than one and a half to two hours after collection, that the increase in weight on a filter not exceed 12 mg, and that air be passed through the filter at 10 l/min.
APTIC-23084

THE FEASIBILITY OF NUCLEAR METHODS FOR THE DETERMINATION OF SO₂ IN STACK GASES.

In: Studies of the Measurement of Sulfur Dioxide in Stack Gases. Texas Nuclear Corp., Austin, AEC Contract AT (30-1)-3880, Rept. ORO-3880-1, p. 251-315, Nov. 30, 1967. 31 refs. CFSTI: TID-25137
J. R. Rhodes, B. S. Burton, and T. Furuta.
Identifiers: *Stack gases, *Radiation measuring systems, *Sulfur dioxide, Feasibility studies, Stacks, Continuous monitoring, Stack sampling, Fluorescence, Gamma radiation, X-rays, Volume.

A feasibility study to identify radioisotopic techniques capable of measuring sulfur dioxide in stack gases is reported. Two main types of instru-

mentation are considered. The first is suitable for 'off-line' analysis, when a sample of stack gas is taken and if necessary suitably prepared before feeding continuously or non-continuously to the sensing head. The second is potentially suitable for continuous on-line analysis. Four nuclear methods for measuring SO₂ are evaluated in some detail. All the nuclear techniques that are at all feasible could be used for off-line SO₂ monitoring and the choice of a suitable method to develop would probably lie between the radiometric methods, the Imamura ion chamber method and X-ray fluorescence. The radiometric methods have excellent sensitivity but require the use of a radioactive reagent. Imamura's method is entirely instrumental and well-suited to continuous sampling; however, its sensitivity is probably too low. X-ray fluorescence is also well-suited to continuous sampling and theoretically has adequate sensitivity and freedom from interferences. X-ray scattering and X-ray absorption using radiation energies in the range 5 to 10 keV are best suited to 'on-line' monitoring of stack gases. In each case the sensitivity is only adequate if the precision of radiation flux measurements are pushed to the practical limit. X-ray scattering is less sensitive to SO₂ than X-ray absorption but the latter is extremely sensitive to density variations. Both are sensitive to variations in fly ash and neither could be used unless fly ash control systems were already installed. The required accuracy of 15% at 500 ppm SO₂ is not likely to be achieved with an on-line method. At best the accuracy at 500 ppm SO₂ will be 50%. However, at 3000 ppm the accuracy should be 10% or better.

APTIC-23088

SAMPLING DUST AND FUME LADEN GASES IN DUCTS OR CHIMNEYS.

British Iron and Steel Research Assoc., London (England), Physics Dept., Rept. P/3/56, 19p., Sept. 1956, 9 refs.

R. A. Granville, and D. F. Ball.

Identifiers: *Dusts, *Fumes, *Stack sampling, Great Britain, Operating variables, Stacks, Intermittent monitoring, Gas sampling, Centrifugal separators, Filters, Design criteria, Humidity, Flow rates, Temperature.

A general procedure is described for preparing a series of gas-borne dust and fume concentration measurements, together with the construction and use of sampling equipment. The procedures to be followed in conducting a preliminary survey of the test area are detailed. At this point, the data such as site selection, gas flow distribution, approximate dust content and its size range, and the facilities available to a test apparatus are determined. These data permit tailoring the general procedure to specific installations. A schematic of a sampling system for gases with a dew point above air temperature is presented, and the design of its components is discussed, along with typical modifications required to compensate for the more common operating variables. Components discussed include the nozzle and probe, filters for various temperature ranges, cooling coil, flow-rate meter, and pump or fan. Operating procedures are considered. Sampling of toxic gases is illustrated and particular mention is made of a small diameter, high efficiency cyclone designed for sampling in large ducts or chimneys.

APTIC-23091

RESEARCH IN CHEMICAL COMPOSITION OF SOME FORMS OF ATMOSPHERIC PARTICLES.

Chicago Univ., Ill., Dept. of Meteorology, NIH Grants RG-4521 and S-12 (C), TN-5, 54p., Dec. 15, 1956, 16 refs.

Ottavio Vittori.

Identifiers: *Particulates, *Chemical composition, *Analytical methods, Wood, Combustion products, Coal, Colorimetry, Particle size, Membrane filters, Electrostatic precipitators, Chlorides, Cyanides, Fluorides, Iodides, Metal compounds, Iron compounds, Lead compounds,

Potassium compounds, Silver compounds, Nitrates, Sulfates, Sulfides.

Procedures are described for identifying the chemical composition and size of airborne particles. The basic technique involves the capture of the particles in a specially treated gel. Reagents in the gel produce a physico-chemical reaction known as the Liesegang reaction. The products of the reaction precipitate in the form of rings. Identification of the particles is made by one or more of three factors: the character of the pattern of the precipitate, the color of the precipitate, or its change of color. Tests were developed for particles containing the following substances: chlorides, soluble iodide, soluble sulfide, soluble ferrocyanide, soluble sulfates, nitrates, potassium ion, soluble silver, fluorides, lead and all heavy metals. Details are given for the preparation of the gels to be used for specific tests, and techniques for the capture of particles are discussed. (Electrostatic precipitation, impactor, and millipore filter). Experiments conducted to study the production of sulfate particles by the burning of wood or coal are discussed briefly, and a technique for the capture of small water droplets and analysis of the salt which may be dissolved in them is described. (Author abstract modified)

APTIC-23096

EXAMPLES OF ODOR MEASUREMENT AT KRAFT PULP MILLS.

(Kurafuto parupukiojo no shukisokutei jirei). Text in Japanese. Akushu no Kenkyu (J. of Odor Control), 1 (1):9-18, April 20, 1970.

Kaku Kikuchi.

Identifiers: *Paper manufacturing, *Odorimetry, Japan, Odors, Boilers, Kraft pulping, Fertilizer manufacturing, Air quality measurements, Gases, Supersaturation, Vapor pressure.

A unique method of measuring odorant concentration developed at Tohoku University. This is a new type of organoleptic method based on the olfactory reaction to determine odor perception thresholds which are numerically expressed. It is also noteworthy that this method is legally authorized to be the only valid means of odor measurement and to be employed as such for air pollution control. The flowchart of the apparatus used for the olfactory test as well as the present odor removal equipments which the kraft pulp mills are operating are illustrated. The principle of this method is based on Henry's law that a gas is saturated in proportion to its partial pressure in the atmosphere after it has been passed through water for a while. The maximum dilution multiplier for the saturated solution which is determined by olfactory sense provides the standard for the obnoxious odor level. The sampled gas needs to be passed through the duct filled with salt water until the concentration of the gas arising from the salt water becomes tantamount to its original level in the atmosphere. The sample solution thus obtained have to be promptly examined by an odor panel because some gases dissolve very readily. The application of this olfactorium to gaseous emissions from both the blow tank and the recovery boiler in a kraft pulp mill was made, and the values obtained showed 700 and 200 respectively. The basic value of 200 was determined from a fish-meal factory). The results of tests conducted on each one of the processes involved in kraft pulp mills by use of this salt water olfactorium are presented in the form of graphs and tables.

APTIC-23106

MEASUREMENT OF AIR POLLUTION AND SOME ASSOCIATED PROBLEMS.

(Taikiosen no sokutei to nisan no mondaiten).

Text in Japanese. Kukichowa to Reito (Air Conditioning Refrig.), 10 (2):56-64, Jan. 15, 1970, 3 refs.

Mototsugu Terabe.

Identifiers: *Nitrogen oxides, *Sulfur dioxide, *Measurement methods, Japan, Automotive emissions, Combustion gases, Odors, Dusts, Fumes,

Colorimetry, Continuous monitoring, Samplers, Hi-vol samplers, Hydrochloric acid, Ammonia, Chlorine.

The methods of atmospheric pollutant measurement are divided into two groups: one dealing with the environmental density of pollutants and the other at the sources with the flue gas or automotive exhausts. For the latter, a number of Japanese Industrial Standards has recently been established. For the measurement of falling dusts, a deposit gauge and a dust jar are used. For the suspended dusts or fumes, three kinds of samplers, tape, high-volume, or Andersen samplers, are described. Sulfur oxides in the air are monitored by lead dioxide, rosaniline or electro-conductivity methods. Electro-conductivity is not affected by NO₂ existing with SO₂, but is considerably dependent on Cl, HCl, or NH₃. The rosaniline method, on the other hand, is affected by NO₂, which can be counteracted by sodium azide of sulfamine acid. Nitrogen oxides, NO₂ or NO, are monitored by Saltzman, phenol disulfonic acid, or an automatic continuous method utilizing colorimetry. The automatic recorders can be calibrated by a permeation tube. An example employing DuPont's fluorinated ethylene propylene resin is described. For the measurement of odor in the atmosphere, the ASTM method, a dilution method, is recommended. Definitions of an odor unit, concentration, and emission rate are given, together with a method of calculating odor concentration and odor threshold. For the details of the measurement the reader is referred to the references.

APTIC-23107

A RE-DETERMINATION OF THE DIAMETERS OF DOW POLYSTYRENE LATEX SPHERES.

Atmos. Environ., 4 (2):149-156, 1970, 4 refs.

M. J. Heard, A. C. Wells, and R. D. Wiffen.

Identifiers: *Electron microscopy, *Styrenes, *Particle size, Synthetic rubber, Aerosols, Aerosol generators.

The diameters of polystyrene latex spheres, used for generating mono-disperse aerosols and for studying the mobility of charged particles, were originally measured by dispersing the spheres on collodion membranes supported on copper electron microscope grids and using an electron microscope. When mobility measurements of spheres that had been stored for 12 months suggested that the present diameters of 0.1 to 1 micron spheres did not correspond to the original measurements, a two-stage investigation was undertaken. First, mixtures of adjacent sizes were mounted on carbon films and the diameter ratios obtained under carefully controlled electron microscope conditions. Secondly, spheres were mounted for electron microscopy on diffraction grating replicas the line spacings of which had been compared with an optical stage micrometer. Differences between the first and second determinations ranged between plus 6% to minus 10%. The cause of the discrepancies is not known, but it is clear that, where accuracies of better than 10% are required, the use of the spheres as dimensional or aerosol standards should be confirmed by simultaneous measurements of the diameters.

APTIC-23109

A PRELIMINARY STUDY OF A MAGNETIC PRECIPITATOR FOR SMALL AIRBORNE MAGNETIC MATERIAL.

Atmos. Environ., 4 (2):213-217, 1970, 16 refs.

G. McGreevy.

Identifiers: *Aerosols, *Magnetic precipitators, Ireland, Aitken counters, Particle size, Flow rates.

A type of magnetic filter suitable for gas-borne magnetic particles in the Aitken nucleus size range is described. Its collection efficiency for particles of approximately 10 to the minus 5th power radius at different rates of flow through the filter is measured. The source of variation in efficiency is discussed. Both theoretical and practical measurements indicate that the collection efficiency is

greater than for smaller particles in the size range examined. Improvements in the design of the magnetic field, preferably by using an electromagnet so that the field strength could be altered as desired, should be investigated. The filter is better suited to particles smaller than the ones studied; sedimentation losses among large particles are so high that the population and average size changes too rapidly to make accurate quantitative measurements. (Author abstract modified)
APTIC-23115

EVALUATION OF SOME PARAMETERS AFFECTING THE COLLECTION AND ANALYSIS OF MIDGET IMPINGER SAMPLES.

Am. Ind. Hyg. Assoc. J., 31 (4):442-445, July-Aug. 1970. 8 refs.
Murray Jacobson, Samuel L. Terry, and Dominick A. Ambrosia.
Identifiers: *Dusts, *Coal, *Operating variables, *Impingers, Particle counters, Particle size, Microscopy, Alcohols, Flow rates, Water.

Coulter counter techniques were used to determine the collection efficiency of the midget impinger for coal dust samples with isopropanol, ethanol, and water as the collecting fluids. Impinger samples are collected in water, different types of alcohol, or mixtures of alcohol and water. Air is drawn through a nozzle at about 70 meters per sec and strikes a plate 5 millimeters from a nozzle. Dust is trapped in the liquid and subsequently examined under a microscope. The collection efficiency of the impinger with the alcohols and water was approximately 95% and 68%, respectively, for particles 1 micron and greater in diameter, and 77% and 64%, respectively, when the particle size range was expanded to include particles down to 0.68 micrometer in diameter. When the midget impinger samples were analyzed by standard microscopic techniques, equivalent counts were not obtained for the two alcohols, indicating the effect fluid viscosity has on standard microscopic techniques. Samples counted in a controlled temperature chamber, using the microscopic technique, showing a change in count of 2.4% and 1.2% per degree centigrade for isopropanol and ethanol, respectively. (Author abstract modified)
APTIC-23121

CURRENT TRENDS IN CONTINUOUS AIR POLLUTION MONITORING SYSTEMS.

ISA (Instr. Soc. Am.) Trans., 9 (1):1-8, 1970. 8 refs. (Presented at the Instrument Society of America, Analysis Instrumentation Division, 15th National Symposium, May 6, 1969.)
R. K. Stevens, A. E. O'Keeffe, and G. C. Ortman.
Identifiers: *Trends, *Continuous monitoring, *Design criteria, Gas chromatography, Photometric methods, Instrumentation, Methanes, Carbon monoxide, Nitric oxide (no), Nitrogen dioxide (no2), Sulfur dioxide, Ozone.

Wet chemical measurements of air pollutants such as sulfur dioxide, nitrogen dioxide, nitric oxide, and ozone are rapidly becoming obsolete. Wet chemical analyzers require almost daily attention and, except for those employing the modified West-Gneke reagent for measuring SO₂, their responses are affected by interfering substances common to polluted atmospheres. Aware of the deficiencies of these analytical systems, the National Air Pollution Control Administration has been sponsoring the development of several second-generation air pollution monitors including an O₃ analyzer based on the chemiluminescent reaction of O₃ with an organic dye, two versions of an SO₂ analyzer based on the chemiluminescent reaction of SO₂ in a hydrogen flame, and a carbon monoxide and methane analyzer based on gas chromatographic principles. After field tests, these new air pollution monitoring systems may well be strong contenders for adoption as standard methods.
APTIC-23130

A MICROMETHOD FOR MERCURY.

Am. Ind. Hyg. Assoc. J., 31 (4):466-471, July-Aug. 1970. 25 refs.
E. L. Kothary.
Identifiers: *Spectrophotometry, *Mercury compounds, Plants (botany), Urinalysis.

A spectrophotometric method for determining small amounts of mercury is based on the reaction of mercuric ion with iodide and crystal violet. Interferences are eliminated by adding sulfite in excess of oxidants, ethyleneglycol monomethyl ether, and ethylenediaminetetraacetic acid. A single extraction step with toluene suffices to determine 0.1 micrograms of mercury in a 1-cm cell with a standard spectrophotometer at 605 nm. Beer's law is followed up to absorbance one. A molar absorptivity of 5600 was obtained with a solvent-to-aqueous phase ratio of 1/20. Procedures are described for air, vegetation, and urine analysis. (Author abstract)
APTIC-23132

MEASUREMENT OF NO AND SO₂ RAMAN-SCATTERING CROSS SECTIONS.

J. Appl. Phys., 41 (10):4238-4239, Sept. 1970. 8 refs.

Donald A. Leonard.
Identifiers: *Lasers, *Nitric oxide (no), *Sulfur dioxide, *Raman-scattering, Spectrophotometry, Monitoring, Calibration methods, Design criteria, Light scattering.

Laboratory measurements were made at 90 and 180 deg of remote laser Raman-scattering cross sections at 357.1 for gaseous nitric oxide and sulfur dioxide. Remote pollution monitors using laser Raman backscattering require knowledge of these cross sections of instrument design and calibration. The measurements were made with mixtures of NO with N₂ and SO₂ with N₂ in the test cell, as required by the desirability of using N₂ Raman scattering as a normalizing standard for atmospheric Raman spectroscopy. Typical data obtained with an equal molar mixture of NO and N₂ at 1 atm total pressure are shown as a plot of counts per min as a function of wavelength. The peaks at 359.9 and 365.8 nm correspond to the vibrational Raman-Stokes shifts for NO and N₂, respectively. Similar data were obtained for mixtures of SO₂ with N₂.
APTIC-23135

COMPARISON OF CYCLONE AND HORIZONTAL ELUTRIATOR SIZE SELECTORS.

Am. Ind. Hyg. Assoc. J., 31 (4):437-441, July-Aug. 1970. 6 refs.
G. Knight, and K. Licht.
Identifiers: *Dusts, *Particle size, *Samplers, Canada, Centrifugal separators, Scrubbers, Calibration methods, Design criteria, Flow rates.

Two recommendations have been made for the specification of size selectors for sampling respirable dust. The first, by the United Kingdom Medical Research Council, was chosen to suit the possibilities of the horizontal elutriator, and to enable the exploitation of its advantages. The second size-selector specification, recommended by the U. S. Atomic Energy Commission Meeting on sampling respirable dust, though possibly nearer to the average lung-deposition curve, has not yet been matched by a size selector. A cyclone can have a size-selection characteristic close to the AEC recommendation, but unfortunately the performance of a cyclone cannot be defined theoretically. Accurate calibration is difficult. The object of the work reported was threefold: to calibrate the 10-mm nylon cyclone against the MRC 'respirable' dust specification by comparison with the horizontal elutriator; to determine the reproducibility of the cyclone estimate of the MRC 'respirable' dust concentration in the range of size distribution and material type likely to occur in mine dust clouds; and to compare the MRC and AEC specifications for respirable dust by comparing the calibration in this report with that of the AEC Health and Safety Laboratory. Dust sam-

plers fitted with two types of size selector, the cyclone and the horizontal elutriator, were compared in a wide range of mineral dust clouds. Results indicate that the cyclone size selector (10-mm hydrocyclone) when operated at 1.4 liters/min gave a 'respirable' dust concentration by mass approximately equal to that obtained by using the horizontal elutriator built to the Medical Research Council (United Kingdom) recommendations. This cyclone at this flow rate also gives a 'respirable' mass concentration corresponding closely to that obtained by using the Atomic Energy Commission (United States) recommendations.
APTIC-23144

COLIFORM AEROSOLS EMITTED BY SEWAGE TREATMENT PLANTS.

Science, 169 (3931):1218-1220, Sept. 1970. 9 refs.
A. Paul Adams, and J. Clifton Spendlove.
Identifiers: *Bacteria, *Aerosols, *Sewage, *Dispersion, Impingers, Humidity.

An investigation of aerosols emitted by trickling-filter sewage treatment plants revealed that coliforms were emitted and have been sampled to a distance of 0.8 mile downwind. Andersen samplers, which impinge collected organisms on a nutrient medium placed in petri plates positioned within stages, were connected to a portable field vacuum source and used to collect the aerosols near and downwind of the sewage treatment plants. Casitone agar was used for the collection and growth of the general microbial population; Endo's medium and eosin-methylene blue medium were used for the selective growth of the coliform organisms. All plates of nutrient mediums were incubated for a minimum of 14 hours at 37 C. As the emitted particles traveled downwind, the relative humidity became more important. If the test was conducted during daylight hours, solar radiation had a deleterious effect. Factors affecting survival of *Escherichia coli* are also presented. Relative humidity is known to have a pronounced effect, but the humidity during these studies was usually low. (Author abstract modified)
APTIC-23156

SYRINGE SAMPLING TECHNIQUE FOR INDIVIDUAL COLORIMETRIC ANALYSIS OF REACTIVE GASES.

Environ. Sci. Technol., 4 (10):853-855, Oct. 1970. 11 refs.
Marston C. Meador, and Robert M. Bethae.
Identifiers: *Colorimetry, *Gas sampling, Hydrochloric acid, Hydrofluoric acid, Chlorides, Nitrogen dioxide (no2), Sulfur dioxide.

A flow apparatus for continuously producing small quantities (up to 280 l/hr) of humidified air containing known amounts of atmospheric contaminants is described. Contaminant levels up to 400 ppm nitrogen dioxide, sulfur dioxide, and chloride are reproducibly maintained for periods in excess of eight days by use of Teflon permeation tubes filled with the desired material. A comparison of the standard bubbler technique and glass and polypropylene syringe gas sampling showed the polypropylene syringe technique to be superior for NO₂ analysis (0.07-60 ppm) by the Lyskow-modified Saltzman method. The improved syringe technique was extended to the colorimetric analysis of SO₂, Cl₂, and hydrochloric and hydrofluoric acids in dynamically polluted air. The Lyskow method for SO₂ is applicable in the range 0.17-50 ppm. The orthotolidine method for free chlorine is applicable in the range 0.12-50 ppm. The modified method of Iwasaki, Utsumi, et al, for HCl is satisfactory for 0.5-50 ppm HCl. The bleaching reaction of Andrew and Nichols is marginally acceptable for 5-50 ppm HF. (Author abstract modified)
APTIC-23162

EXTINCTION AND FORWARD SCATTERING IN A SETTLING AEROSOL.

Appl. Opt., 9 (10):2372-2376, Oct. 1970. 12 refs.
B. J. Lipofsky, and A. E. S. Green.

Identifiers: *Aerosols, *Measurement methods, *Particle size, *Light scattering, Mathematical modeling.

It is possible to calculate the scattering properties of an aerosol of known size and index of refraction. The inverse problem, that is the determination of aerosol characteristics from scattering data, is more difficult. A method is described which allows it to be done. The optical depth of a settling aerosol is measured as a function of time. An analytic model is fitted to the time record of the optical depth. This allows an inversion of the problem which results in an analytic model for the size distribution of aerosol particles for radii between 1 micron and 10 micron. The model size distribution is verified by comparison with data from a direct microscope count of particle sizes. The model size distribution is then used to calculate the time behavior of forward scattered light. This calculation is compared to experiment to provide further corroboration of the aerosol size distribution. (Author abstract modified)
APTIC-23164

THE IDENTIFICATION OF THE ORGANIC FRACTION OF AIR SAMPLE.

Atmos. Environ., 4 (2):199-207, 1970. 11 refs.

L. Dubois, A. Zdrojewski, P. Jennawar, and J. L. Monkman.

Identifiers: *Benzene-soluble organic matter, *Chromatography, *Spectrophotometry, Canada, Fuel oils, Aliphatic fractions, Aromatic fractions, Oxygenated fractions, Analytical methods, Absorption, Infrared spectrometry, Ultraviolet spectrometry, Polynuclear compounds, Fluorescence, Infrared radiation, Ultraviolet radiation.

In the measurement of airborne polycyclic aromatic hydrocarbons using ultraviolet spectrophotometry, non-specific absorption is observed which increases as the wavelength decreases. This absorption or 'background' can be caused by the presence of airborne aromatic compounds from lubricating oil and/or fuel oil due to evaporation, volatilization, and incomplete combustion. Oxygenated compounds present in the organic extract of air samples are also responsible for a background. The air sample extract was obtained by putting in a Soxhlet extractor circles cut from glass fiber sheets and refluxing for 6 hr with 50 ml of cyclohexane. After evaporation of the solvent with a flow of clean nitrogen (3 hr), the residue was weighed and redissolved in iso-octane so that an aliquot of 5 ml contained 10 mg. The 10 mg oil sample measured by weighing was also dissolved in 5 ml iso-octane. Samples were placed on columns 1 cm in inside diameter and 30 cm in length, filled to a depth of 12.5 cm with 28-200 mesh activated silica gel. The gel was activated by heating it overnight at 140 C. The columns were then eluted with 400 ml of iso-octane, and all the fractions were combined to form the aliphatic group. By eluting with 100 ml of benzene, the aromatic group was then obtained, and finally the oxygenated compounds were obtained by elution with 100 ml of ethyl alcohol. These groups and composites were studied by ultraviolet absorption, fluorescence, and infrared and gas chromatography. Some suggestions are made towards improving the chromatographic separation and minimizing the background effect. (Author abstract modified)
APTIC-23169

THE CHANGE OF THE SMALL ION DENSITY DUE TO CONDENSATION NUCLEI AND THE RELATION TO THE EXTINCTION COEFFICIENT OF LIGHT.

American Medical climatology, Philadelphia, Pa., Proc. Intern. Conf. Ionization Air, Philadelphia, Pa., 1961, 1 (5): 13p. 9 refs.

Lothar H. Ruhnke.

Identifiers: *Extinction coefficient, *Ions, *Light radiation, *Density, *Visibility, *Measurement methods, *Particle size, *Mathematical analyses, *Condensation, *Nucleation.

Because the ionization by natural radioactive material of the ground is relatively stable, there is a possibility to determine the density of air pollution by small ion measurements with a fair degree of accuracy. The ratio between charged and uncharged nuclei and the combination coefficient ratios have been used to find a relation between small ion density and the density and radius of the condensation nuclei. If the radii of the particles are greater than 3 times 10 to the minus 5th power cm, it is possible to relate the ion measurements directly with the extinction of light and with the visibility.
APTIC-23173

RECOMMENDED STANDARD METHOD FOR CONTINUING DUSTFALL SURVEY (AFM I-A).

J. Air Pollution Control Assoc., 5 (3):176-181,

Nov. 1955.

Personal Author Not Recorded.

Identifiers: *Dust fall, *Particulate sampling, *Survey methods, *Measurement methods, *Sampling methods, *Gravity settling, *Statistical analyses.

As presently practiced, the measurement of rate of dustfall is subject to various possible errors in the technique of measurement and in the interpretation of the final result. A new method of measuring average dustfall over a large area has been proposed. The method is expected to promote a uniform approach to measurements and to permit a valid comparison to be made between data collected in a number of regions. The method employs open-top cylinder sampling jars and classifies the area around a suspected source of pollution according to the character of urban activity in the vicinity of the sampling station. The stations are to have a free exposure so that a sampling jar collects the sample by gravity settling only. The top of the dustfall container is to be a minimum of 8 ft and a maximum of 50 ft from the ground, or 4 ft minimum above any other surface such as a roof. The dustfall samples are to be analyzed for total and water-soluble solids, the pH of the collecting liquid, total combustibles, metals, and organic and inorganic radicals. With respect to the reporting of data, a chart is presented for summarizing data for an entire year. It is recommended that the reported means be accompanied by its limits as shown in the table. The unit of rate of dustfall used in the suggested method is pounds per thousand square feet per thirty days. This unit, representing the weight of material falling on an area roughly the size of an average dwelling, can instill a better appreciation for the conditions of dustfall than the old unit of tons per square mile per month.
APTIC-23183

MODIFICATION OF AEROSOL SIZE DISTRIBUTION IN THE ATMOSPHERE AND DEVELOPMENT OF AN ION COUNTER OF HIGH SENSITIVITY. (FINAL TECHNICAL REPORT).

For primary bibliographic entry see Field 05.

APTIC-23190

SURVEY OF LITERATURE RELATING TO ATMOSPHERIC POLLENS AND HAY FEVER.

For primary bibliographic entry see Field 01.

APTIC-23191

OXYGENATES IN AUTOMOTIVE EXHAUST GAS: PART I. TECHNIQUES FOR DETERMINING ALDEHYDES BY THE MBTH METHOD.

Coordinating Research Council Proj. CM-59-65, CRC Rept. 415, 21p., June 1968. 7 refs.

Personal Author Not Recorded.

Identifiers: *Engine exhausts, *Mbth method, *Aldehydes, *Internal combustion engines, *Gas sampling, *Nitrogen oxides.

The MBTH method in analysis of automotive exhaust for aldehydes is investigated from the standpoint of applicable precision and accuracy. Results

indicate that instability of the MBTH reagent and inadequacies in sampling procedures may considerably affect both the precision and accuracy of analysis. The problem of reagent instability is resolvable by either appropriate selection of a commercial product or repeated filtration of the reagent solution. The sampling procedure of collecting exhaust samples in plastic bags causes erratic results in aldehyde measurement due to both loss and build-up of aldehydes. Such errors are reduced by receiving the exhaust sample from the tailpipe or proportional sampler directly into the aldehyde absorption bubbler or collecting the exhaust sample in a bag containing at least sevenfold nitrogen and under conditions securing rapid mixing. Use of bubblers for aldehyde-reagent contact appears to be advantageous over use of evacuated flasks in that bubblers reduce nitrogen-oxides interference. Precision levels for a number of currently applied variations of the MBTH method are determined. (Author summary modified)
APTIC-23195

OXYGENATES IN AUTOMOTIVE EXHAUST GAS: PART II. TECHNIQUES FOR DETERMINING ALDEHYDES BY THE DNPH METHOD.

Coordinating Research Council Proj. CM-59-65,

CRC Rept. 417, 26p., March 1969. 8 refs.

Personal Author Not Recorded.

Identifiers: *Dnph method, *Engine exhausts, *Aldehydes, *Internal combustion engines, *Chromatography, *Formaldehydes, *Carbonyls, *Hydrazines, *Hydrazones, *Ketones.

A chromatographic method utilizing 2,4-dinitrophenyl-hydrazine (DNPH) to measure constituents of exhaust gas is described. Applicability of the DNPH method for determining carbonyl compounds in automotive exhaust was studied using synthetic mixtures of aldehydes and ketones typically present in exhaust. Results from parallel application of the gravimetric and chromatographic variations of the DNPH method showed disagreement that was attributed to inaccuracy associated with one or both analytical procedures. Quantitative data obtained from analysis of synthetic mixtures by the DNPH method appeared to be more reliable for formaldehyde than for the other carbonyl compounds. Errors were attributed both to contamination and to nonquantitative isolation of the hydrazone product that resulted from contact of the carbonyl compound with the DNPH reagent. Further research is needed to identify and remove sources of interfering contamination and to reduce sample losses occurring in the process of isolating and purifying the hydrazone derivatives. Evidence obtained thus far is judged to be inadequate in establishing applicability of the DNPH method in exhaust gas analysis. (Author summary modified)
APTIC-23196

RAPID DETECTION OF ANILINE VAPORS IN AIR.

Anal. Chem., vol. 27: 1768-1769, Nov. 1955. 8 refs.

Wilbur A. Riehl, and Karl F. Hager.

Identifiers: *Aniline, *Colorimetry, *Acetic acid, *Aldehydes, *Amines.

Aniline vapor in concentrations above 5 ppm (by volume) in air is known to be toxic. Current applications of aniline make it imperative that a fast and simple field method be developed. The concentration of aniline vapor in the air can be determined easily and rapidly by use of paper strips impregnated with the liquid or vapor of a furfural-acetic acid mixture (4%, by volume, in glacial acetic acid). The test paper turns from white to pink or red in the presence of aniline vapor, having a range of determination from 5 to approximately 150 ppm. The speed and intensity of color development increases with the concentration of aniline vapors. The test is specific for aniline in the presence of many other organic vapors. The reagent mixture has a life of at least 1 month at room temperature. (Author abstract)
APTIC-23197

NEW METHODS FOR TRACING ATMOSPHERIC AEROSOL FORMATION FROM REACTIVE HYDROCARBONS.

Staub (English translation from German of: Staub, Reinhaltung Luft), 29 (9):13-18, Sept. 1969. 29 refs. CPSTI: TT 69-55002/9

Alexander Goetz.

Identifiers: *Hydrocarbons, *Radioactive tracers, *Aerosols, United states, Haze, Photooxidation, Ultraviolet radiation.

A new method is described for tracing and recording the presence and concentration of reactive hydrocarbons in ambient air. The process consists of converting those HC-traces which can cause haze formation in the atmosphere through partial photochemical oxidation into aerosol particles by means of exposing a steady airflow briefly to ultraviolet irradiation. The particles are then precipitated in a moving slide impactor in order to determine the stability of the particulates during exposure to prolonged irradiation, and higher temperature levels which cause volatilization of HC-components into gaseous end-products. The instruments developed for this purpose are briefly described and some typical results presented. (Author abstract modified)

APTIC-23201

IMPORTANCE OF CULTURE MEDIUM COMPOSITION IN DETERMINING MICROBE CONTAMINATION OF AIR.

Med. Zh. Uzbekistana, no. 2:48, 1963. Translated from Russian. Foreign Technology Div. Wright-Patterson AFB, Ohio, Translation Div., 2p., Feb. 20, 1970. CPSTI, DDC: AD 704018

G. N. Ishchenko, and K. Khamrakulova.

Identifiers: *Microorganisms, *Sampling methods, *Culture medium, Ussr.

Results are presented of the number of microorganisms in 1 cu m of air as determined, respectively, with the Krotov device and by the jar-cap method on different agar media. The amount of growing colonies was several times greater in seedlings taken by the jar-cap method than with the Krotov device. Colonies from the air seedlings obtained by both methods grew least of all on simple agar. When the jar cap method and sugar agar were employed, the number of colonies increased 1.5 to 6 times. The best results were obtained on agar with rabbit blood.

APTIC-23209

CARBON MONOXIDE CONCENTRATION TEST PROCEDURE—SAE J989: SAE RECOMMENDED PRACTICE.

S.A.E. TR- J989, 2p., 1968.

Personal Author Not Recorded.

Identifiers: *Carbon monoxide, *Vehicles, *Sampling methods, Automotive emissions, Engine operating cycles.

A procedure is presented for testing carbon monoxide concentrations in passenger compartment of vehicles and assuring that body design and tailpipe outlet locations are not causing undesirable levels of CO under normal vehicle usage. The tests are conducted at idling speed, at 25 mph, and decelerating from 70-20 mph in an outdoor area where there is a minimum amount of environmental CO. With one exception, the procedure applies only to self-contamination by CO; it is not applicable to measurements of ambient CO in traffic. Samples are taken from specified locations at the start of the test and at 15-min intervals until the CO concentration reaches 100 ppm or until 60 min have elapsed. If the concentration is near the 100 ppm level and has not stabilized during the 60 min, two more readings are taken. The idle and 25 mph portions of the test can be suspended after 30 min if the CO concentration is 10 ppm or less. For each vehicle tested, the following data are to be recorded: make of vehicle; model, odometer, engine carburetor and emission control system description; location of tailpipe (s) and outlet (s); wind velocity, instrumental description; and percent CO concentration in the vehicle at the various

time intervals during the test and sample volume (cc) for readings.

APTIC-23227

H₂S RECORDER.

(Du Pont de Nemours (E.I.) and Co., Wilmington, Del.) U. S. Pat. 2,232,622. 4p., Feb. 18, 1941.

(Appl. March 23, 1940, 3 claims).

Douglas V. Moses, and Lawrence T. Jilk.

Identifiers: *Hydrogen sulfide, *Membrane filters, *Colorimetry, Potentiometric methods, Hydrocyanic acid, Carbon monoxide, Nitrogen oxides, Peroxides.

A gas analyzer for determining and recording the concentration of hydrogen sulfide is described. The device utilizes a chemically-impregnated, gas-permeable tape which changes in light-reflecting power when exposed to H₂S. The method responds rapidly and is not affected by side-reactions. Previous analysis methods have the disadvantages of being regulated by adjusting the flow of reagent liquid; having a large time-lag between sampling and indicating; and making substantial errors when the gas being analyzed contains impurities. The method described has advantages over previous methods in that it can be regulated mechanically; there is no interference from impurities; and it can be utilized under moist conditions, if necessary. Other examples of colorimetric measurement in which this type of treated tape could be used include nitrogen peroxide, hydrogen cyanide, and carbon monoxide.

APTIC-23256

REACTION OF NITROGEN OXIDES WITH AMMONIA AND AMMONIUM HYDROXIDE.

Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2 (1):98-100, 1967. Translated from Japanese. 8p. Saburo Sugano, Shozo Fukui, Shoji Naito, and Mikihiro Kaneko.

Identifiers: *Stack gases, *Gas sampling, *Nitric oxide (no), *Nitrogen dioxide (no₂), *Ammonium compounds, Japan, Ammonia, Hydroxides, Sodium hydroxide, Nitrates, Nitrites, Nitrogen, Chemical reactions, Oxidation, Ions, Water.

The reaction between nitrogen oxides and ammonia and ammonium hydroxide was studied. The validity of the equation $2\text{NO}_2 + 2\text{NaOH} \rightarrow \text{NaNO}_2 + \text{NaNO}_3 + \text{H}_2\text{O}$ was confirmed by determining the NO₂ and NO₃ ions in solution. It was also confirmed that NH₄OH reacted with NO₂ as expressed by $2\text{NO}_2 + 2\text{NH}_4\text{OH} \rightarrow \text{NH}_4\text{NO}_2 + \text{NH}_4\text{NO}_3 + \text{H}_2\text{O}$. However, gaseous NH₃ reacted with NO₂ as shown by $2\text{NO}_2 + 2\text{NH}_3 \rightarrow \text{NH}_4\text{NO}_3 + \text{N}_2 + \text{H}_2\text{O}$. This reaction was rapid and exothermic and was useful for the removal of NO₂. Although NO did not directly react with NaOH or NH₃, its air oxidation in the presence of NaOH or NH₃ proceeded as follows: $2\text{NO} + \text{O} + 2\text{NaOH} \rightarrow 2\text{NaNO}_2 + \text{H}_2\text{O}$ or $2\text{NO} + \text{O} + 2\text{NH}_4\text{OH} \rightarrow \text{NH}_4\text{NO}_2 + \text{N}_2 + 3\text{H}_2\text{O}$. In this case, reactions with NaOH and NH₄OH produced different mols of NO₂ ion. On oxidizing the mixture of NO₂ and NO in the air and collecting it in alkali, if a NaOH solution was employed, 1 mol of NO₂ produced 1/2 mol of NO₂ ion and 1 mol of NO produced 1 mol of NO₂ ion. Thus it was impossible to determine the total quantity of NO₂ plus NO unless one of the two gases was determined by using some other method. However, on collecting in an NH₄OH solution, 1 mol of either NO₂ or NO produced 1/2 mol of NO₂ ion, so that twice the quantity of NO₂ ion was equal to the quantity of NO plus NO₂. Based on this experimental result, the NH₄OH solution was adopted as the collecting solution for NO₂ plus NO in the standard method of determining NO and NO₂ in flue gas described in Japan Industrial Standards.

APTIC-23265

PRELIMINARY REPORT ON ATMOSPHERIC POLLEN STUDIES.

Rutgers Univ., New Brunswick, N. J., Farm Crops Dept., Suppl. Proc. Northeast. Weed Control Conf., New York City, 1950, p. 34-50. 1 ref. (Jan. 3-5.)

John S. Wiley, and Clarence N. Tarzwell.

Identifiers: *Pollen collectors, Pollens, Impingers, Electrostatic precipitators, Winds.

Tests were conducted to compare the efficiencies of gravimetric and volumetric samplers for determining ragweed pollen in air. A number of gravimetric samplers were modified to permit two slides to be placed back-to-back, one the standard face-up slide and the other an inverted slide. The results indicated that conversion of gravity accounts to a volumetric basis in accordance with Stoke's Law of sedimentation is unwarranted. While counts were higher on the standard slide, appreciable counts were obtained on the inverted slide. This suggests that sedimentation of pollen grains on standard slides may be responsible for not more than 50-60% of the count actually deposited. Thus more emphasis should be put on the impingement of particles on coated slides due to wind or air action. There appeared to be a fair direct correlation of the gravity counts with elevation and wind velocity and an inverse correlation with rainfall. Three types of samplers were used in the volumetric sampling: a standard impinger, an electrostatic fume and dust precipitator, and an electrostatic bacterial air sampler. A significantly greater pollution count per cubic foot of air was obtained by the latter sampler than by either of the other two devices. Gravity slide counts bore no constant ratio to any of the volumetric counts.

APTIC-23268

ON SENSORY EVALUATION OF ODOROUS AIR POLLUTANT INTENSITIES. MEASUREMENTS OF ODOR INTENSITY IN THE LABORATORY AND IN THE FIELD WITH SPECIAL REFERENCE TO EFFLUENTS OF SULFATE PULP FACTORIES.

Nord. Hyg. Tidskr. (Stockholm). Suppl. 2, 181p., 1970. 145 refs.

Thomas Lindvall.

Identifiers: *Kraft pulping, *Odorimetry, Mobile, Thresholds, Sweden, Stack gases, Odors, Air pollution forecasting, Meteorology.

A primary concern in the investigation of the environmental hygienic annoyance effects of odorous air pollutants is to establish a relationship between the dose to which the population is exposed and the degree of annoyance experienced. The present study describes a method for sensory analysis of odor intensities of air pollutants, primarily as a base for a valid dose-description. The work was concerned with the air conservation problems of the sulfate pulp industry from the standpoint of environmental hygiene and was primarily aimed at the development of a method to study the relative importance of various odor generating processes in regard to the final odor intensity of the emissions, to study the effects of various types of odor-reducing systems, to predict odor distribution in the vicinity of a factory on the basis of odor determinations of the emitted exhausts and meteorological dispersion data, and to study the feasibility of predicting exhaust gas odor intensities from their physicochemical composition. A mobile odor laboratory for field experiments was constructed with the purpose of obtaining a standardized experimental environment independent of the location of the laboratory and the presence of odors in the vicinity. The equipment permits the determination of absolute odor threshold, signal detectability as well as supraliminal odor intensities of both simple and complex exhausts. A practical and economical variant of an ascending method of limit with paired comparisons was tested and found suitable for determining the absolute threshold for both individuals and groups of subjects. Due to the wide stimulus range, the method is readily adaptable to variations in individual odor sensitivity and in the

intensity of the test gases. The influence of context in sensory analyses was studied with reference to the effects of adaptation, motivation, practice and certain biological variables. The consequences of these investigations with regard to the construction of the experimental equipment and the method are discussed.
APTIC-23278

PRELIMINARY ASPECTS OF AN AIR POLLUTION PROBLEM.

Florida Univ., Gainesville, Coll. of Engineering, Thesis (M.S.), June 1954, 96p. 106 refs.
Eugene A. Zwenig.

Identifiers: *Fluorides, *Colorimetry, *Spectrophotometry, Air quality measurements, Analytical methods, Sampling methods, Transport, Meteorology.

A project intended to determine a practicable method of fluoride appraisal in micrograms/cu l of air is reported. The meteorological considerations involved are discussed, and definitions and assumptions are established pertaining to the interrelationship of the atmospheric transport mechanism and field sampling results. A sampling plan and sampling method are described. Laboratory techniques for the analysis of samples and the elimination of interferences are detailed. Two analytical methods, thorium-alizarin titration and spectrophotometry, are concluded to be useful as potential standard techniques, but neither is established as adequate. The principal conclusion offered is that more work is required in all areas. Fluoride measurements obtained in the vicinity of an unidentified potential pollution source and from control stations in areas presumed to be free of fluoride pollution are presented tabularly. Control station readings are uniformly zero while the test station readings range from 0 to 2.6 micrograms/cu l.
APTIC-23286

STEADY-STATE CORRELATION OF DIESEL SMOKE METERS - AN SAE TASK FORCE REPORT.

Preprint, Society of Automotive Engineers, Inc., New York, 4p., 1969. 4 refs. (Presented at the Society of Automotive Engineers, Mid-year Meeting, Chicago, Ill., May 19-23, 1969, Paper 690492.)

A. W. Carey Jr.

Identifiers: *Diesel engines, *Smokemeters, Engine exhausts, Soot, Smokes.

Test procedures and results are reported of a program to establish usable correlations between the following instruments for diesel smoke measurements: Bosch spotmeter, BP-Hartridge smokemeter, USPHS and Beckman 912 light extinction opacity meters, and exhaust gas soot content (Caterpillar absolute filter method). All meters were compared to the Bosch spotmeter system. To minimize scatter and the possible effect of minor variations in engine smoke output, a Bosch spotmeter sample was taken at the same instant as the other meter was read. Results demonstrated the strong effect of stack size on the apparent opacity of the smoke column, an effect accurately predicted by the Beer-Lambert relationship.
APTIC-23296

COMPARATIVE CHARACTERISTIC OF SOME OF THE DEVICES USED TO DETERMINE THE MICROBIAL CONTAMINATION OF THE AIR.

Med. Zh. Uzbekistana, no. 6:16-18, 1962.

Translated from Russian by V. Mesenzeff,

Foreign Technology Div., Wright-Patterson AFB,

Ohio, Translation Div., 4p., March 16, 1970.

CFSTI, DDC: AD 705164

G. N. Ishchenko, K. Khamrakulova, and R.

Samigullin.

Identifiers: *Kroto apparatus, *Koch plate culture, *Bacteria, Ussr, Sampling methods, Samplers, Flow rates.

Measurements of microbial contamination of air are made with two different types of instruments, and the results are compared. The instruments used are the Kroto apparatus and the Koch plate culture. The testing is carried out in classrooms, with metal cans of approximately 1.5 liters volume being tested for microbe content. The results indicate that a considerable number of bacteria are not caught by the Kroto apparatus. This is proven by testing the air leaving the Kroto apparatus. The effect of flow rate on the results is determined. It is obvious that the Kroto method does not give satisfactory results. The can-plate method gives better results.
APTIC-23297

ENHANCED STABILITY OF SO₂ IN SOLUTION.

Preprint, American Chemical Society, Washington, D. C., 1969. 7 refs. (Presented at the American Chemical Society, 158th National Meeting, New York, Sept. 1969.)

F. P. Scaringelli, L. Elfers, D. Norris, and S.

Hochheiser.

Identifiers: *Sulfur dioxide, *Operating variables, *Colorimetry, Liquids, Ph.

Because of its specificity, the most widely used procedure for determining sulfur dioxide in ambient air involves the collection of the pollutant in a solution of tetrachloromercurate (TCM) for subsequent colorimetric analysis. However, SO₂ is unstable in TCM, and the reported values are frequently underestimated. Laboratory tests show that the addition of 0.066 of the disodium salts of ethylenediaminetetraacetate (EDTA) to 0.04M TCM solution enhances the stability of SO₂ in solution, lowers its decay rate, and also removes interferences of heavy metals. Although incorporation of EDTA increases the acidity of the solution from a pH of 5.4 to a pH of 4.0, this has no effect on collection efficiency.
APTIC-23299

DYNAMIC TRACE-GAS DILUTION SYSTEM.

Atmos. Environ., 4 (2):209-212, 1970. 8 refs.

Herman D. Axelrod, John B. Pate, W. Richard

Barchet, and James P. Lodge Jr.

Identifiers: *Dilution system, *Trace analysis, *Design criteria, Sulfur dioxide, Hydrogen sulfide.

A gas dilution apparatus is described which has several advantages over permeation tubes for producing calibrated low gas concentrations to be used as laboratory standards. Although permeation tubes are inexpensive, lightweight, and convenient for field use, only liquefiable gases can be used with the permeation tubes, and gases such as carbon dioxide and nitrogen dioxide which affect Teflon can weaken and rupture the walls of the tube. The modified Woesthoff system can accept all gases and does not demand stringent environmental controls. This system can provide trace gas concentrations of 100 ppm to 0.1 ppb at flows up to 30 lpm. Design criteria are included, as well as a schematic diagram of the apparatus. The diluting system was tested by analyzing for hydrogen sulfide and sulfur dioxide. Elimination of the fluctuating concentration in output caused by the sudden pulsing emission of gas into the dilution stream is also described.
APTIC-23317

COMPARISON OF PARTICLE SIZE DETERMINED WITH THE COULTER COUNTER AND BY OPTICAL MICROSCOPY.

Am Ind. Hyg. Assoc. J., 31 (4):446-453, July-Aug. 1970. 24 refs.

K. R. Schrag, and M. Corn.

Identifiers: *Coulter counter, *Optical microscopy, *Particle size, Dusts, Particle counters, Particle shape, Calibration methods, Mathematical analyses, Microscopy.

Particle size distributions for selected dusts were derived from measurements with a Coulter

counter and by microscopy. The success of the Coulter counter in other fields has led to its being considered for use in the counting and sizing of dusts in industrial hygiene. Stock suspensions of silica, fly ash, coal, limestone, mica, and glass beads were prepared by sieving with filtered isopropyl alcohol through a 10-micron sieve. Coulter counter and projected area methods of particle sizing will assign the same size to a particle only if it is spherical. For the particles investigated, the size assigned by projected area measurements could differ from that assigned by volume distributions are calculated from projected area size measurements, errors in excess of 500% are possible. This has serious implications if the erroneous distributions are used to assess the possibility of dust penetrating into the lung or to calibrate respirable dust samplers. In these situations, the use of projected area size would indicate that the dust is much coarser than it actually is. Similarly, where the optical screening power of a dust is being studied, it is imperative that the particle be sized by projected area methods. (Author summary modified)
APTIC-23321

SOME EFFECTS OF PARTICLE SIZE ON MEASUREMENTS OF FINE AIRBORNE PARTICULATES.

ASHRAE (Am. Soc. Heating, Refrig. Aircond.

Engrs.) Trans., 76 (part 1):26-37, 1970. 10 refs.

N. G. Ziesse, and G. W. Penney.

Identifiers: *Suspended particulates, *Measurement methods, *Particle size, Dusts, Light scattering, Electric charge.

Four particulate measurement types are compared with respect to particle size: filter paper staining, forward light scattering by airborne particles, electrical charge carrying ability, and light scattering by particles deposited on a front-surface mirror. The size-range of interest is approximately 0.3-2.0 micron. All tests were conducted on outdoor air in Pittsburgh, Pa., using a centrifuge to obtain size data. The evaluation of each type of measurement was accomplished by performing the measurement on both air which had been centrifuged and air which had not. The ratio of the two measurements is a fraction which indicates the relative importance of the particles which have been removed by the centrifuge. Of the four types of measurements studied charge carrying ability is most influenced by fine particles. With Pittsburgh air, more than 50% of the charge is carried by particles with a Stokes diameter of less than 0.3 micron. Filter paper staining is less sensitive to the fine particles, but a significant amount of stain is still produced by the collective behavior of particles of the same size or smaller than the wavelength of the illumination. Light scattering measurements on airborne particles as well as those deposited on a mirror exhibited even less sensitivity to the fine particles. Forward scattering measurements on airborne dust in Pittsburgh show 5% or more of the light scattered by particles with Stokes diameters below 0.3 micron. The same particle sizes on a mirror, when illuminated at 45 deg and observed at 90 deg to the surface, scatter 15%. At this angular condition, mirror scattering is influenced significantly more by the finer particles than forward scattering. If, however, the mirror is observed at a small angle to the specularly reflected beam, the influence of larger particles is enhanced and the results approach those for forward scattering by airborne particles. The front-surface mirror appears to offer one method of studying particle deposition under typical conditions of surface soiling. It is easily mounted in a test location and permits dark field microscopic evaluation by light scattering. While relatively small quantities of dust are adequate for evaluation, sufficient dust must still be present to overcome scattering by surface imperfections in the mirror. Tests are being conducted with polished black carat glass, which appears to have significantly fewer surface imperfections.
APTIC-23325

APPLICATION OF THE METHODS OF EXAMINATION AND ANALYSIS OF COAL AND COKE PETROGRAPHY TO THE STUDY OF INDUSTRIAL DUSTS.

(Application des méthodes d'examen et d'analyse de la pétrographie des charbons et des coques à l'étude des poussières industrielles). Text in French. Ann. Mines Belg., no. 5:665-693, May 1970. 9 refs.

Identifiers: *Petrography, *Dusts, *Coal, *Coke, Steel, Belgium, Industrial areas, Residential areas, Mineral processing, Primary metallurgical processing, Air quality measurements, Analytical methods.

A study was conducted to evaluate petrographic techniques of examination and analysis in the identification and quantification of industrial dusts. Samples were obtained in the area of direct emission of a coking plant with the intention of having a precise knowledge of the composition of the sample before the analysis. Methods of sample preparation, microscopic examination, and quantitative analysis are described. It is concluded that the techniques of petrography provided satisfactory results in this study and can be readily adapted to other air pollution situations. Of particular interest with respect to its application in the area of a steel mill or coking plant is that it is possible to identify the stage of processing at which the pollutant was emitted. One of the results of the quantitative analysis was the determination that the plan, to have a precise foreknowledge of the sample composition, was to no avail. All samples showed a quantity of material characteristic of the metalworking factories that surrounded the area in which the coking plant was located. Results of sampling at the coking plant and in a nearby residential area are presented tabularly and discussed.

APTIC-23326

HYDROCARBONS AND ATMOSPHERIC POLLUTION.

(Hydrocarbures et Pollution atmosphérique). Text in French. Talanta. 17 (8):729-737, 1970. 57 refs. Denise Halot.

Identifiers: *Toxicity, *Sources, *Analytical methods, *Hydrocarbons, Cancer, France, Automotive emissions, Industrial emission sources, Petroleum production, Domestic heating, Chromatography, Gas chromatography, Gas sampling, Samplers, Ultraviolet spectrometry, Anthracenes, Benzopyrenes, Combustion, Fluorescence, Ultraviolet radiation.

A survey is given of the source of hydrocarbons found in the atmosphere, of their toxicity, and of the methods of analysis available for polycyclic aromatic hydrocarbons. Aliphatic and aromatic hydrocarbons in the air derive from evaporation in refineries and incomplete combustion in automobiles. Polyaromatic hydrocarbons derive from pyrogenic decomposition of oil and petroleum; these are carcinogenic. Hydrocarbons in the atmosphere are benzopyrene, benzofluoranthene and dibenzanthracene. Methods of extraction are filtration with paper or glass filter; extraction is also achieved through chromatography. Data on the relative quantities of hydrocarbons in the air are obtained with ultra-violet spectrometry. It is a reliable method for determining quantities of known hydrocarbons; however ultra-violet rays modify the structure of polycyclic hydrocarbons. Fluorimetry presents these advantages: a) All carcinogenic hydrocarbons are fluorescent. b) It is a very sensitive method. However, it is less precise than spectrometry and it depends on the type of solvent used. A new method is chromatography on gaseous phases. In this cases difficulties are presented by the multiplicity of products contained in the atmospheric dust and the very high boiling point of carcinogenic hydrocarbons that can cause polymerization of the substances examined.

APTIC-23328

COMPOSITION AND DETERMINING OF SOOT EMISSIONS.

(Zusammensetzung und Bestimmung von Russmissionen). Text in German. Wasser Luft Betrieb, 14 (7):283-285, July 1970. 17 refs. Vaclav Masek.

Identifiers: *Soot, *Analytical methods, *Measurement methods, Cancer, Lubricants, Tar, Germany, Dusts, Fuels, Coke, Soot fall, Particulate sampling, Membrane filters, Nitric acid, Sulfuric acid, Chloroform, Benzo (3-4)pyrene, Iodides, Acetone, Chromates, Potassium compounds, Organic sulfur compounds, Oxygen, Oxidation, Reduction, Temperature.

Coke is the least soot-forming fuel. With increasing length of the hydrocarbon chain the intensity of soot formation increases in the absence of excess oxygen. A dangerous component of soot is 3,4-benzopyrene because it is carcinogenic. Depending on the origin the 3,4-benzopyrene, content fluctuates in 12 analyses from 0.1 to 609 microgram/g with the latter figure resulting from hard pitch. The quantitative determination of soot in atmospheric dust can be accomplished by dissolving aspirated atmospheric dust with chloroform (photometrically pure soot caused 100 times darker colouring than soot-free dust), by boiling a dust sample in nitric acid and by determining pure carbon after the destruction of organic substances and after drying for 2 hours at 700 C, by aspiration through a filter tube filled with glass wool, by heating the captured soot with a bichromate solution and sulphuric acid and by titrating the remaining K₂Cr₂O₇ following the addition of potassium iodide with a solution of sodium thiosulfate; 1 mg pure soot reduces on the average 16 mg K₂Cr₂O₇. A Czechoslovak method retains atmospheric dust on a membrane filter, dissolves the soot with acetone and transfers it to white paper whose change in colour is compared with standard pure soot which is obtained by the incomplete combustion of light mineral oil. In the city of Prague in winter the atmospheric soot content was 0.133 mg cu m air. These and other methods yield somewhat divergent results also because standard pure soots differ.

APTIC-23330

THERMAL DECOMPOSITION OF BARIUM SULFATE TO SULFUR DIOXIDE FOR MASS SPECTROMETRIC ANALYSIS.

Anal. Chem., 42 (12):1451-1453, Oct. 1970. 11 refs. Ben D. Holt, and A. G. Engelkemir.

Identifiers: *Mass spectrometry, *Barium compounds, *Sulfates, *Decomposition, Quartz, Sulfur dioxide, Sulfur compounds, Isotopes, Temperature.

For mass spectrometric studies of sulfur isotopes, a method is described in which barium sulfate is converted to sulfur dioxide in one operation, unlike previous procedures which required a series of chemical reactions. Covered with pulverized quartz powder in a fused quartz tube, the barium sulfate is heated under vacuum to the softening point of quartz (about 1400 C). Gas bubbles evolve from the liquefied mass, and a pronounced increase of pressure in the vacuum line registers on the thermocouple gauge. Within ten minutes of the initiation of heating, the pressure in the vacuum line ordinarily drops back to 0.0001 Torr, indicating that the decomposition of the BaSO₄ is complete. Sulfur dioxide is collected in a cold trap, the oxygen is pumped away, and the barium oxide fuses with the silica surroundings. The collected SO₂ is distilled into a storage bulb for subsequent mass spectrometric analysis. A correction for the small oxygen-18 interference in the mass spectrometric analysis can be conveniently calculated from measurement of both the 66/64 and the 50/48 mass ratios by means of the formula which is provided. By cleaning the tubing in 1:1 hydrogen fluoride, gaseous impurities of carbon dioxide were reduced to 2%. Results of thermal decomposition of BaSO₄ in an inductively-heated platinum crucible are reported for varied experimental conditions.

APTIC-23342

CLEAN AIR MANAGEMENT IN ALLEGHENY COUNTY, PA.

J. Sanit. Eng. Div. Am. Soc. Civil Engrs., vol. 96 (SA 5):1211-1219, Oct. 1970. (Presented at the American Society of Civil Engineers Annual and Environmental Engineering Meeting, Chicago, Ill., Oct. 13-17, 1969.)

Edward L. Stockton.

Identifiers: *Air quality measurement programs, *Allegheny county, Area surveys, Survey methods, Pennsylvania, Valleys, Particulates, Electric power production, Transportation, Continuous monitoring, Computers, Winds, Humidity, Temperature (atmospheric), Topographic interactions, Sulfur dioxide, Hydrogen sulfide, Solar radiation.

In 1969, Allegheny County changed its air monitoring program from one of 30-day sample data from dustfall cans and sulfate candles to continuous ambient air measurement of air pollution. Of the projected network of 18 remote stations, two stations will evaluate the hill-valley relationship to air pollution concentrations near major industrial sources. Other stations will evaluate specific emissions from known industrial, transportation, and power plant sources. Data from fairly clean sites will provide information on background levels and reflect changes in pollution with corresponding meteorological changes. Sensors for the stations are being selected on the basis of known or anticipated emissions in the area, the number depending on the parameters to be measured and meteorological data desired. At the first station in the network, the following parameters are measured: sulfur dioxide, hydrogen sulfide, fine particulates, wind speed, wind direction, temperature, humidity, and solar radiation. Telemetered data from the sensors are processed by a computer which issues hourly printouts of five-min pollutant averages, five-min highs, the time when the high was reached, hourly averages, hourly highs, and real time recording of data. Programming is being expanded to process inspection data, emission inventory data, and simulation modeling. It is anticipated that the completed network of 18 stations will be operational in late 1969 or early 1971.

APTIC-23350

4. AIR QUALITY MEASUREMENTS**SULFA-DIOXIDE IMMISSION MEASUREMENTS IN THE REGION NORDRHEIN-WESTFALEN FROM NOVEMBER 1, 1967 TO OCTOBER 31, 1968. (SIC).**

Schriftenreihe Landesanstalt Immissions-und Bodennutzungsschutz Landes Nordrhein-Westfalen (Essen), no. 16: 1-7, 1969. 11 refs.

Translated from German. Belov and Associates, Denver, Colo., 13p., Feb. 1969.

H. Stratmann, and H. Ixfeld.

Identifiers: *Air quality measurements, *Sulfur dioxide, *North rhine-westphalia, Germany, Industrial areas.

In large areas of North Rhine Westphalia, especially along the heavily industrialized areas of the Rhine and Ruhr Rivers, measurements were performed to determine the distribution of sulfur dioxide emissions. Measurements were made at 5280 locations in accordance with a statistical plan. Emission distributions for the entire supervised region are presented on maps. Comparisons of current values and values obtained in previous years are presented for the Ruhr Valley and selected towns and counties. The trend indicating a continuous decrease in sulfur dioxide emissions for most cities and counties of the region which was observed during previous measurement periods was not continued during the 1967-1968 period. While 23 cities and counties continued to decrease, 23 others showed increases. All cities and counties in the western and southern sections showed an increase of about 10%. The counties of Kempen-Krefeld, Rees, and Dinslaken showed increases of about 20%. The program of air quality monitoring will continue during 1969.

APTIC-19445

ATMOSPHERIC AIR POLLUTION IN LITHUANIAN CITIES.

U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 8: 174-179, 1963. (B. S. Levine, ed.) CFSIT: 63-11570
P. N. Zhilin.

Identifiers: *Urban areas, *Dust fall, *Lithuania, Children, Morbidity, Respiratory diseases, Influenza, Pneumonia, Tuberculosis, Usar, Dusts, Industrial emission sources, Steam plants, Paper manufacturing, Air quality measurements, Sulfur dioxide, Area surveys.

The results of a series of air quality measurements made over a period of years in the cities of Vilna, Kaunas, and Klaipeda are reported. Two electric heat and power stations and a number of manufacturing plants were found to be the chief sources of pollution in the Lithuanian SSR, as determined by dust measurements. Children living in the vicinity of one of the power plants were examined in 1952 for respiratory effects from pollution; the resulting morbidity data showed that influenza, adenoids, pulmonary tuberculosis, and pneumonia occurred most frequently among children living in the areas of greatest air pollution. It is recommended that dust collectors be installed at coal- and steam-operated electric stations and that two large power plants and most smaller domestic and industrial buildings convert to gas burning. In addition, the cellulose paper plant in Klaipeda should take steps to reduce sulfur dioxide emissions, some changeover to electric transportation systems should take place, and certain industrial plants should be moved to locations away from populated areas. Inspection and reporting stations are needed to achieve greater pollution control.
APTIC-20377

DETERMINATION OF FORMALDEHYDE IN THE ATMOSPHERE.

(Taikichu no formaldehyde nobodo ni tasotte). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):121, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

N. Yamate, and T. Matsumura.

Identifiers: *Tokyo, *Air quality measurements, *Formaldehydes, Annual, Diurnal, Monthly, Urban areas, Dusts, Vehicles, Spectrophotometry, Carbon monoxide, Nitric oxide (no), Nitrogen dioxide (no2), Sulfur dioxide.

In order to clarify the actual behavior of formaldehyde in air, a continuous measuring instrument for formaldehyde had previously been developed which used absorption spectrophotometry with acetyl acetone solution which colors on absorption. The instrument gave an average value of measurements in an hour with a full scale of 0 to 20 ppm. The results of the measurement in 1968 at Kasoo-Migaseki pollutant measuring station in Tokyo are now presented. The number of measurements was 6740; yearly average, 0.76 ppm; yearly maximum value, 4.8 ppm; monthly maximum 0.90 ppm (in July); and daily maximum, 1.96 ppm. The frequency of concentration groups was 0.05 to 0.5 ppm, 42.5%; 0.6 to 0.9 ppm, 28.3%; 1 ppm, 25.9%; 2 ppm, 3.0%; 3 ppm, 0.2%; and above 4 ppm, 0.03%. For daily variation pattern, it shows a minimum at 6 am, starts to increase about 8 am, and shows a maximum around 1 pm, which continues to about 5 pm and then starts to decrease. A correlation was found between formaldehyde concentration and concentrations of carbon monoxide, sulfur dioxide, nitric oxide, nitrogen dioxide, airborne dust, and traffic volume as follows, using n as the numbers of measurement, v as the correlation coefficient, and T as the traffic volume cars/hr: (CO ppm : $399.9 \text{ HCHO ppm} + 1.64$, n equals 6270, v equals 0.521; SO₂ ppm : $5.84 \text{ HCHO ppm} + 0.035$, n equals 5885, r equals 0.467; NO ppm : $5.88 \text{ HCHO ppm} + 0.022$, n equals 5066, v equals 0.271; NO₂ ppm : $2.04 \text{ HCHO ppm} + 0.019$, n equals 5281, r equals 0.324; Dust mg/cu m : $19.477 \text{ HCHO ppm} + 220.0$, n equals 4041, r equals 0.251; and HCHO ppm : $0.00001187 - 0.0068$, n equals 6208, r equals 0.462.
APTIC-21812

ATMOSPHERIC POLLUTION FROM NITROGEN DIOXIDE.

(Pollution atmosphérique par le peroxyde d'azote). Text in French. CR Acad. Sci., Paris, Ser. C, 270 (22):1764-1765, June 1, 1970. 4 refs.

Olga Tanaevsky.

Identifiers: *Air quality measurements, *Paris, *Nitrogen dioxide (no2), Seasonal, Urban areas, Engine exhausts, Industrial emission sources.

The comparison of measurements made in 1956, 1961, and 1969, in Paris shows that concentrations of nitrogen dioxide in the air have increased significantly. The rise is due probably to industrial pollution and to gases escaping from automobiles. The highest weekly values occur on Friday, the day of maximum population circulation. Values continue to be higher in winter than in summer. Values obtained in 1969 were 10 to 35 times higher than those obtained in 1956 and 1951.
APTIC-22157

THE CHATTANOOGA SCHOOL CHILDREN STUDY: EFFECTS OF COMMUNITY EXPOSURE TO NITROGEN DIOXIDE. 1. METHODS, DESCRIPTION OF POLLUTANT EXPOSURE, AND RESULTS OF VENTILATORY FUNCTION TESTING.

For primary bibliographic entry see Field 07.
APTIC-22168

A COMPARISON OF THE SPECTRAL DISTRIBUTION OF SOLAR RADIATION IN A POLLUTED AND A CLEAN AIR MASS.

For primary bibliographic entry see Field 05.
APTIC-22339

AIR POLLUTION TEST PROGRAM IN BERLIN.

(Luftuntersuchungsprogramm in Berlin. Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 33:19-24, 1970. 19 refs.

Erdwin Lahmann, and Karl-Ernst Prescher.

Identifiers: *Berlin, *Air quality measurements, Seasonal, Germany, Streets, Urban areas, Dusts, Coal, Dust fall, Continuous monitoring, Intermittent monitoring, Meteorology, Winds, Ammonia, Chlorine, Fluorine, Carbon dioxide, Carbon monoxide, Sulfur dioxide.

On August 1, 1968, six automatic testing devices for sulfur dioxide were installed in 6 different locations of West Berlin and the readings were transmitted by telephone to a central recording station. Subsequently the testing program was enlarged by the continuous testing of carbon monoxide, carbon dioxide, dust, and hydrocarbon levels in one location, by intermittent SO₂ level tests in 82 other localities, by intermittent testing of fluorine, chlorine, and ammonia levels in one station, and of dust in 2 stations and 2 other localities. Wind velocity and wind direction were measured in 1 station in addition to the meteorological data available from the Meteorological Institute of the Free University of West Berlin. The SO₂ emission recorded equalled or exceeded the SO₂ concentration measured in similar programs in other West German cities which is explained by the widespread use of sulfur-rich brown coal from deposits in central Germany by Berliners. Under adverse weather conditions, CO levels in sections with little traffic were as high as in streets with heavy traffic. The highest median half-hour levels exceeded 20 ppm CO. In remote sections of the city, emission fluctuations are influenced by meteorological factors much stronger than in heavy traffic areas. During the period from August to January, CO emission exceeded by from 50-97.5% that measured during the period February-July.
APTIC-22348

THE CORRELATION BETWEEN SULFUR DIOXIDE AND FLUORIDE EMISSION.

(Untersuchungen ueber die Korrelation zwischen Schwefeldioxid- und fluorid-Immissionen). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 33:25-28, 1970. 11 refs.

Erdwin Lahmann, and Joergen Westphal.

Identifiers: *Air quality measurements, *Mathematical analyses, *Fluorides, *Sulfur dioxide, Germany, Urban areas.

The existence of a correlation between the emission of sulfur dioxide and of fluorides was studied from analytical data collected over 12 month periods in Berlin, in Mannheim-Ludwigshafen, and around Cologne. Fluorides were determined by the impinger method; SO₂ by an automatic testing device or manually by the silica gel method. The median correlation coefficients calculated for Berlin for periods of 1 month exceeded the value plus or minus 0.27 only once (February 1969, r equalled 0.71). This low correlation also emerged from calculations for the other two areas under study. The exceptionally single high coefficient must be considered accidental. In none of the three areas did the results of correlation analysis indicate the existence of a linear relationship between SO₂ and fluoride emissions. No conclusions can be drawn from SO₂ measurement on simultaneous fluoride emission as in the case of CO measurements where a correlation was found to exist with hydrocarbon and lead emissions.
APTIC-22359

EQUIPMENT OF AND RESULTS HITHERTO OBTAINED BY THE SAMPLE MEASURING STATION IN FRANKFURT/M.

(Einrichtung und bisherige Ergebnisse der Probenstation Frankfurt/M.). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 30:19-45, 1970. 27 refs.

Erich Weber.

Identifiers: *Area surveys, *Air quality measurements, *Continuous monitoring, Survey methods, Germany, Air pollution forecasting, Transport, Winds, Carbon dioxide, Sulfur dioxide.

The first processed results obtained from the Frankfurt/M. station for continuous air pollution control (founded in 1963), now published, demonstrate the success of such monitoring stations. The frequency distribution of sulfur dioxide, for example, differs only slightly from results obtained by other measuring methods. From the carbon dioxide: sulfur dioxide ratio and from wind velocity and direction, conclusions can be drawn about the effect of various pollutants. The relative decrease in SO₂ content during transport in the atmosphere is also measured. Combination analyses of the behavior of other components permit the prediction of the effect of certain groups of pollutants and of their reduction by pollution control devices on the composition of the atmosphere. The data obtained will permit the forecasting of excessive air pollution under certain weather conditions, the determination of the source of the pollution, the forecasting of the future trend and of the effect of these emissions. It is questionable whether the data obtained will be sufficient basis for the institution of direct measures in the case of individual pollutants. This can be achieved only when the pollutant is known, when the emissions can be correlated and when excesses of admissible concentrations can be measured.
APTIC-22360

CHLORIDE EMISSION MEASUREMENTS IN THE VICINITY OF A GARBAGE DISPOSAL INCINERATOR.

(Chlorid-Immissionsmessungen in der Umgebung einer Muellverbrennungsanlage). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 33:29-33, 1970. 12 refs.

Erdwin Lahmann, and Manfred Moeller.

Identifiers: *Chlorinated hydrocarbons, *Incineration, *Air quality measurements, Seasonal, Germany, Stack gases, Hydrochloric acid, Chlorides.

Flue gases from refuse incinerators contain chlorinated hydrocarbons originating from the incineration of plastics (especially polyvinyl chloride) the share of which is estimated to amount to 1-3% of the refuse of which about half contains chlorine in one form or another.

Hydrochloric acid concentrations in West Germany were as high as 0.7 g/N per cu m flue gas. Chloride emission tests were performed 6 times a week at different times of day over a period of one year at a downwind distance of 1500 m from the main refuse incinerator of West Berlin in Ruhleben. The Hg-rhodanide method was used for analysis. The median value of the 282 stationary measurements was 0.038 and the maximum value, 0.132 mg chloride per cu m air. Twenty percent of the tests exceeded the concentration limit of 0.050 and 2.6% the limit of 0.100 mg/cu m. Only inconspicuous maxima were noted in the morning and in the evening. The median chloride concentration during December, January and February was 0.036 compared with 0.031 mg/cu m during June, July and August. The median chloride concentration under the main eastern wind direction was 0.049 mg/cu m; under the remaining 7 other principal wind directions, it was from 0.031 to 0.038 mg chloride/cu m. No conclusions can be drawn from the data recorded about the effect of the refuse incinerator on chloride emission into the environment. APTIC-22413

OZONE DETERMINATION AND FUME EXTINCTION.

(Ozonmessung und Dunstextinktion). Text in German. Meteorol. Rdach., 23 (3):76-77, May-June 1970. 3 refs. Ruediger Greil. Identifiers: *Air quality measurements, *Ozone, Annual, Monthly, Seasonal, Germany, Valleys, Stack gases.

A large series of ozone determinations (1551) made at the Arosa Observatory from August 1964 to December 1965 was analyzed with the introduction of absorption coefficients as recommended by the International Ozone Commission. Results revealed great fluctuations between individual determinations which are attributed to the circumstance that fume extinction was measured by means of an instrument which was constructed for another purpose, namely for ozone determination where fume extinction should be eliminated. Monthly averages of extinction coefficients manifested a marked annual variation with positive values from November to March and negative values in the remaining months. Thus in summer with a normal extinction in winter, an anomalous extinction prevailed. Where more than 6 measurements per day were available, diurnal variation manifested a peak at noon with normal extinction and a noon minimum with anomalous extinction. The winter anomaly is attributed to the effects of an artificial aerosol from flue gas residues in the stagnant atmosphere of the narrow Arosa valley. APTIC-22425

AIR CONTAMINATION OF UNDERGROUND SHOPPING CENTERS AND ITS FUTURE PROBLEM.

(Chikagai ni okeru taiki oson to kongo no mondai). Text in Japanese. Kukichowa to Reito (Air Conditioning Refrig.), 10 (2):25-32, Jan. 15, 1970. 4 refs. Akio Kotsugai. Identifiers: *Altitude, *Bacteria, *Fumes, *Suspended particulates, *Air quality measurements, Japan, Commercial areas, Automotive emissions, Air conditioning equipment, Filters, Winds, Carbon dioxide, Carbon monoxide, Sulfur dioxide.

The height of the air supply and exhaust tower and the direction and speed of wind relate to the contamination of air in underground shopping centers and parking lots. An investigation of the influence of carbon monoxide in the atmosphere 1.5 m aboveground on the air of an underground town confirmed a direct influence. Underground parking areas also affect the air of underground centers by increasing the concentration of carbon monoxide by 50%. The carbon monoxide concentration at several entrances showed higher values than at the

center of the underground shopping centers. Carbon dioxide concentration contributed through breathing was not significant. Indoor contamination of air by sulfur dioxide was affected by outdoor pollution but the situation differs every day and by the time of day. Suspended particles density was investigated and the gravimetric results were contrasted with concentration by particle numbers. The difference in the results was due to the difference in the testing conditions, and the elimination of large particles and fibers in the counting method. The number of large particles or fibers was 10/litre. Bacteria contamination depended on the number of people. Floating bacteria underground number more than aboveground, but air conditioning, floor cleaning improvements, low ceilings and the occasional decrease in population sometimes cause inverse results. Special conditions of air contamination in underground centers need appropriate countermeasures. For each substance, the concentration value indicated serious contamination of underground air. Odors and suspended bacteria can be eliminated by active carbon or sterilization lamps at the filter but their application to underground town air pollution control is the task for the future. APTIC-22535

AIR POLLUTION AND RELATED DISEASE OF INDUSTRIAL DISTRICTS IN NORTHERN KYUSHU.

For primary bibliographic entry see Field 07. APTIC-22537

NITROGEN DIOXIDE AND NITRIC OXIDE IN NON-URBAN AIR.

J. Air Pollution Control Assoc., 20 (9):589-592, Sept. 1970. 17 refs.

Lyman A. Ripperton, Lawrence Kornreich, and James J. B. Worth.

Identifiers: *Non-urban areas, *Nitric oxide (no), *Nitrogen dioxide (no2), Diurnal, Air quality measurements, Altitude, Transport, Advection, Convection (atmospheric), Turbulence (atmospheric), Ozone.

Measurements of nitrogen dioxide and nitric oxide were carried out in Piedmont, N. C. and in the southern Appalachian Mountains. In the Piedmont area, average NO₂ values at 30 ft and 120 ft elevation were 0.76 ppbm and 0.61 ppbm, respectively. At four feet, average NO₂ was 0.56 ppbm and average NO 0.19 ppbm. Mountain top values (5120 ft) were as follows: NO₂, 0.40 ppbm; NO, 0.26 ppbm. In both locations NO₂ decreased when O₃ concentrations rose, indicating the presence of a ground source of NO₂ and a source aloft for O₃. Both NO₂ and O₃ tended to decrease in Piedmont at night, probably as the result of the reaction of the two gases with each other and with other substances at a time when vertical transport rates were reduced. The NO₂ concentrations showed a morning maximum and an afternoon minimum, after which concentrations rose again until sundown. Ozone values were higher than NO₂ values on sunny days and ahead of cold fronts, probably as the result of greater depth in mixing. The data reported are consistent with the belief that a major sink for NO_x is reaction with O₃ and ultimate conversion to nitrate. APTIC-22634

CHEMICAL POLLUTION OF THE CITIES' AIR.

(La pollution chimique de l'air des agglomérations urbaines). Text in French. Pollut. Atmos (Paris), 12 (46):73-79, April-June 1970. H. Moureu.

Identifiers: *Smog, *Industrial emission sources, Costs, Animals, Humans, Plant damage, Health impairment, France, Urban areas, Dusts, Aromatic hydrocarbons, Peroxyacetyl nitrate, Carbon monoxide, Nitrogen oxides, Sulfur dioxide, Ozone, Photooxidation, Reaction mechanisms.

The three basic sources of the cities' chemical pollution are reviewed, and the most characteristic pollutants are listed. They include sulfur dioxide, carbon monoxide, polycyclic aromatic hydrocarbons produced by incomplete combustions, mineral dust, and nitrogen oxides. The association of these pollutants provokes the noxiousness that is observed. Los Angeles-type oxidizing smog is described. This phenomenon occurs when ozone peroxyacetyl nitrate combine. PAN has been identified in the Parisian atmosphere in much lower proportions than in Los Angeles. Various mechanisms for the formation of acidic smog are described. The effects of air pollution on the health of man, animals, and vegetable life are studied. The approximate cost of air pollution in the United States, England, and France is given. The complexity and seriousness of the air pollution problem are stressed. (Author abstract modified) APTIC-22662

DAILY MEASUREMENTS OF THE MAIN ATMOSPHERIC POLLUTION AGENTS IN THE CITY AND THE SUBURBS OF CLERMONT.

(Mesures journalières des principaux polluants atmosphériques dans l'agglomération clermontoise). Text in French. Pollut. Atmos (Paris), 12 (46):86-93, April-June 1970. 16 refs. G. Andraud, M. F. Bernigaud, R. Chuzel, and L. P. Verelle. Identifiers: *Carbon monoxide, *Sulfur dioxide, *Clermont, *Air quality measurements, France, Non-urban areas, Urban areas, Engine exhausts, Smokes, Domestic heating.

Systematic measurements of the atmospheric pollution in the city and suburbs of Clermont are described, and results are tabulated. The pollutants measured are carbon monoxide, sulfur dioxide, and smoke. The results of the measurements show a central zone in which the pollution is maximal, whether it is caused by exhaust gases (CO in ppm) or by household or industrial burners (SO₂ in micrograms/cu m). The importance of these pollutants diminishes in the peripheral zone and practically disappears in the suburbs. The measuring program is being extended to include better coverage and to include the influence of meteorological effects on the pollutants. (Author abstract modified) APTIC-22663

THE ATMOSPHERIC POLLUTION AROUND A PETROLEUM REFINERY.

(La pollution atmosphérique autour d'une raffinerie de pétrole). Text in French. Pollut. Atmos (Paris), 12 (46):80-85, April-June 1970. 3 refs.

T. Bourelly. Identifiers: *Petroleum production, *Air quality measurements, Area surveys, France, Smokes, Winds, Sulfur dioxide.

The study of the atmospheric pollution in the area surrounding a petroleum refinery construction site is described. Determinations were made of the smoke and sulfur dioxide content of the air at four locations 2.9-5.6 km from the refinery from September 1968 through August 1969. Wind speed and direction were also recorded. These data are presented tabularly and graphically and compared with similar data obtained in the other two zones of the Paris air pollution control district. A later study will be made to compare the role of the refinery in polluting the atmosphere. For the comparison to be meaningful, one of the main precautions to observe will be to take into account the variations of the general atmospheric pollution when evaluating the variations within the studied zone. (Author abstract modified) APTIC-22664

ATMOSPHERIC AEROSOL COMPOSITION AND CONCENTRATION AS A FUNCTION OF PARTICLE SIZE AND OF TIME.

J. Air Pollution Assoc., 20 (9):603-608, Sept. 1970. 3 refs.

Dale A. Lundgren.

Identifiers: *Time, *Aerosols, *Particle size, Diurnal, Hourly, Los Angeles, Particulates, Smog, Air quality measurements, Sampling methods, Meteorology, Iron compounds, Lead compounds, Nitrates, Sulfates, Light scattering, Gases.

As a step toward better understanding of the reactive Los Angeles air basin atmosphere, studies were conducted at Riverside to determine the composition and concentration of atmospheric particulate matter as a function of particle size and time. The study involved developing a method for obtain size-classified, time-fractionated aerosol samples amenable to chemical and physical (including microscopic) analysis. During a 15-day period, samples were obtained over four-hr periods and subsequently analyzed for nitrate, sulfate, iron, and lead. Concentration of six gaseous pollutants, total aerosol light scattering, and several meteorological measurements were simultaneously recorded and averaged over the four-hr intervals. A strong relationship between gaseous peroxyacetyl nitrate, particulate nitrate, and aerosol light scattering was found. High concentrations of ammonium nitrate particles, mainly in the 0.5-2 micron diameter range, were found in the atmospheric particulate samples collected on days of very high smog. The data obtained is presented graphically to show diurnal variation in the relationship among gaseous, particulate and meteorological measurements. (Author abstract modified)

APTIC-22829

AMMONIA DETERMINATION IN THE URBAN ATMOSPHERE.

(Ammoniak-Bestimmungen in Grosstadtluft). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 33:35-39, 1970. 22 refs. Siegfried Haentzsch, and Erdwin Lahmann. Identifiers: *Urban areas, *Air quality measurements, *Ammonia, Annual, Diurnal, Seasonal, Germany, Industrial areas, Residential areas, Stack gases, Dispersion, Winds.

A total of 281 air samples containing emissions from both the residential and industrial sectors of West Berlin were taken by an automatic sampling device at different times of day over a period of 1 year and analyzed for their ammonia content by the indophenol method; results were tabulated. The maximal concentration recorded was 97 microg NH₃/cu m; the median concentration was calculated as 17.6 microg/cu m. The limit of 20 microg/cu m was exceeded by 33% of the recorded levels; that of 50 microg/cu m, by only 2.3%. The median daily ammonia concentrations calculated from 12 individual recordings for each hour of the day did not manifest any characteristic maxima as related to weather or to emission strengths. The atmospheric ammonia in winter with a level of 21.2 was significantly higher than in summer when it was 16.2 microg/cu m. This can be attributed to higher flue gas emissions and to more unfavorable conditions for their distribution in the atmosphere in winter. Wind direction did not cause any particular emission source to have a preponderant influence on the air sample composition; the results may thus be considered typical for urban atmospheres in general as is born out by comparison with measurements in American and Soviet cities.

APTIC-22833

RELATIONSHIPS AMONG ATMOSPHERIC FORMALDEHYDE, METHANE, AND KRYPTON.

Arkansas Univ., Fayetteville, Thesis (Ph.D.), 1969, 135p. 79 refs. CFSTI: TID-25286 Edmund Cook Shearer.

Identifiers: *Krypton, *Air quality measurements, *Formaldehydes, *Methanes, Non-urban areas, Urban areas, Nuclear power plants, Lower atmosphere, Rain, Hydrogen, Photooxidation.

Atmospheric samples were routinely collected over a period of 10 months at an urban and rural sampling site for methane concentration measure-

ments. Lower than other reported measurements, the rural samples averaged 0.89 ppm by volume while the urban samples averaged 1.26 ppm. Fluctuations are due to the production rate of methane, civilization, and meteorological conditions. Based on these data, calculations were made for new production rate of methane, the atmosphere's methane inventory, and the lifetime of methane. Rain is an extremely efficient scavenger of formaldehyde. Rain samples containing formaldehyde were routinely collected and measured for the concentration of formaldehyde and for the tritium content of formaldehyde. The average formaldehyde concentration is 0.75 mg/l. Using available spectral data, a lifetime of 1.67 days is obtained for formaldehyde. Because this will be a major source of hydrogen that has not yet been treated, marked revision is recommended. That formaldehyde has a tritium content like that of atmospheric methane is strong evidence that the undiscovered tropospheric sink of methane is incomplete oxidation to formaldehyde. For a period of more than a year, methane and krypton were collected over a 24 hour period in a rural area for isotopic studies. The T/H ratio for methane generally ranged from 1 to 5 times 10 to the 4th power T. U., strengthening the proposal that continuous nuclear industrial release in the northern hemisphere is just balancing the radio and chemical destruction of tritiated methane. (Author abstract modified)

APTIC-22899

AIR POLLUTION CAUSED BY AUTOMOBILE EXHAUST GASES IN CITIES AND INDUSTRIAL AREAS.

(Ueber die durch Kraftfahrzeugabgase verursachte Luftverunreinigung in Staedten und industriellen Ballungsgebieten). Text in German. Z. Hyg., 5 (13):326-333, 1967. 52 refs. W. Frietsch.

Identifiers: *Urban areas, *Automotive emissions, *Air quality measurements, Germany, Streets, Industrial areas, Automobiles, Winds, Aldehydes, Hydrocarbons, Carbon monoxide, Nitric oxide (no), Nitrogen dioxide (no2), Ozone, Sulfur dioxide.

Measurements undertaken in the Ruhr area and in large European, American, and Japanese cities disclosed that while the maximal carbon monoxide pollution on a windless oppressively hot day at a city crossroad can reach 25 to 35 ppm CO, a gentle wind can reduce that level to one tenth, even in rush hour traffic. A critical analysis of street pollution concluded that while street pollution was not primarily a CO pollution problem, the CO level was a good indicator of the overall pollution level. Automobile traffic in cities contributes 45% of the CO pollution with maximal values measured 50 cm above street level. Peak pollution of 100 ppm which is considered acutely toxic occurs only for very short periods and no acutely toxic pollution level exists in European cities. Carbon monoxide pollution levels in Los Angeles and Detroit show a similar pattern. The effect of traffic density on CO pollution levels is decisive only when unfavorable meteorological factors do not affect emission levels more. Of the few measurements of hydrocarbon pollution, data for Los Angeles registered a median pollution level of 1.32 ppm and a maximal level of 2.33 ppm. Nitrogen oxide pollution (NO plus NO₂) amounted to from 0.2 to 3 ppm; aldehyde pollution (U.S.A.), from 0.27 to 1.87 ppm; ozone (U.S.A.), from 0.2 to 1 ppm; SO₂, from 0.05 to 0.1 ppp (Detroit) and from 0.1 to 0.3 (California). Data gathering procedures are proposed which could serve as guidelines for legislative purposes concerning pollution control in cities of the D.D.R.

APTIC-22900

AN ANALYSIS OF DUST MEASUREMENTS IN THREE CITIES IN THE NETHERLANDS.

Meded. Verhandel., no. 86:68p., 1964. 18 refs. F. H. Schmidt.

Identifiers: *Urban areas, *Dusts, *Air quality measurements, *Meteorology, Annual, Seasonal,

Europe, Lower atmosphere, Diffusion, Winds, Rain, Stability (atmospheric), Turbulence (atmospheric).

The results of two years hourly or bihourly dust observations in the center of Rotterdam are analysed with regard to a connection with meteorological and other circumstances. Relatively large differences occur between the annual variation of the dust content of the air in 1957 and in 1958. These differences can be related to differences in meteorological circumstances during both years, at least partly. Differences in wind direction are of importance in relation with the asymmetric distribution of dust sources around the observation point. Moreover, wind speed and rainfall play a role. High wind speeds and large amounts of precipitation both result in a decrease of dust content. The variation of the dust content of the air in Rotterdam through the week show the same pattern as found elsewhere. The influence of wind force on the dust content is investigated in detail. During the winter half year, dust content appears to decrease with increasing wind force. In the summer half year, such an effect can hardly be detected. This difference in behavior is assumed to be due to the fact that during the winter half year, the upward diffusion of dust is almost completely caused by dynamic turbulence which becomes more intense with increasing wind force; in the summer half year, vertical diffusion is for the greater part due to frequently occurring instability. During the latter season, a relation between diffusion rate and wind force is difficult to find. The influence of wind direction on the dust content of the air is analysed. The fact that on-shore winds cause the stratification of the lower layers of the atmosphere to become stable in the cold season and unstable in the warm season determines the behavior of the dust content in both seasons for an important part. (Author summary modified)

APTIC-22911

A STUDY OF AIR POLLUTION BY ANALYSIS OF PARTICULATE MATERIAL COLLECTED FROM AIR FILTRATION PLANTS. PART II. DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN TOTAL AIR SOLIDS.

Intern. J. Air Water Pollution (London), vol. 6:387-390, 1962. 18 refs.

A. J. Lindsey, and J. R. Staehury.

Identifiers: *Air quality measurements, *Polynuclear compounds, Carcinogens, Great Britain, Particulates, Column chromatography, Spectrophotometry, Anthracenes, Fluoranthenes, Perylenes, Pyrenes.

The polycyclic aromatic hydrocarbons pyrene, fluoranthene, 1,2-benzpyrene, 3,4-benzpyrene, perylene, 1,2-benzperylene, and anthanthrene were determined in air solids collected at two-week intervals throughout the year from an air filtration plant. Extraction with cyclohexane followed by alumina column chromatography and ultraviolet spectroscopy were the methods employed. Amounts varied in the well-known yearly cycle for combustion pollution. The yearly average figures expressed as percentage of the total air solids were 0.012 for the seven hydrocarbons and 0.0014 for 3,4-benzpyrene, while these were contained in soluble organic matter amounting to 4.5%. This material may contain compounds with biological activity exceeding that of the known carcinogens present in air solids. (Author abstract modified)

APTIC-22965

ATMOSPHERIC AEROSOLS.

Science, vol. 166:381-382, Oct. 17, 1969. 5 refs.

R. O. McCaldin, L. W. Johnson, and N. T. Stephens.

Identifiers: *Aerosols, *Particle size, *Air quality measurements, Urban areas, Aircraft, Visibility, Particle counters, Flow rates.

Data obtained by means of an instrumented aircraft are presented for particle numbers and size distribution of atmospheric aerosols at various locations in the U. S. Sample air is drawn into the aircraft through a rubber tube protruding from the leading edge of the aircraft wing, and air flow rates are reduced by use of a number of inverted Y's. The dust counter employed has an upper counting limit of 36 particles per cu cm and a lower limit of about 0.03 particle per cu cm. Particle size distributions found in the various flights are depicted in an array of curves, one of which shows the influence of urban air pollution on visibility. The measurements are considered important in view of the effect of aerosols on visibility and the resulting hazard to both air and ground traffic.

APTIC-23046

SOME EXAMPLES OF INVESTIGATING ODOR POLLUTION. PART II.

(Akushu kogaichosa no nisan no jirei. tsuzuki). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 1 (2):19-23, June 20, 1970. 27 refs.

Yasuyuki Hoshika.

Identifiers: *Questionnaires, *Thresholds, *Odorimetry, Humans, Japan, Odors, Chemical processing, Gas chromatography, Transport, Meteorology, Topographic interactions.

The data from the experimental field survey of the odor problem in three areas adjacent to two chemical plants and a drug plant are analyzed. The items included in the questionnaire were subjective olfactory perception, weather conditions, subjective symptoms of health injury from the odor, opinion of existing odor problem and similar questions. Due to geographical features, odor bearing emission gas in one area, was observed to form atmospheric odor layers flowing over hilly suburbs and covering the whole area as far as 2 km away. In another area, odor level was found almost same as in the past. A comparison of the data with the results derived from the field measurement of odor by an olfactometer and gas chromatography was attempted to determine the correlation between the olfactory perception thresholds and the quantitative data from odor measurement devices. Odorous emission from the chemical plants was measured to be 10 million cu m/hr and nearly 10 billion cu m/hr from the drug plant as was initially expected, the odor intensity index obtained by the olfaction test and the odor intensity multiple of threshold value detected by the meters were not necessarily the same. By constructing a table that shows the relationship between organoleptic and mechanical measurement results, it might be possible to infer as to whether the odor components complement or neutralize each other, whether other odor components not detectable by measurement devices exist, or whether there are other background odors in the general area.

APTIC-23098

MEASUREMENTS OF SULPHUR DIOXIDE OVER THE NORTH SEA.

Atmos. Environ., 4 (2):225, 1970.

C. Brosset, and K. J. Marsh.

Identifiers: *Air quality measurements, *Sulfur dioxide, *North sea, Hourly, Great Britain, Sweden, Oceans, Ships, Continuous monitoring, Sampling methods.

During a return voyage from Gothenburg to Tilbury between the 24th and 29th of April, 1969, some measurements were made of atmospheric sulfur dioxide from the deck of the MS Saga. Measurements were made as a pilot experiment to determine how far the pollution from England - and particularly London - could be detected over the North Sea. For this purpose, a Model 67 SO₂ Analyser was installed on the upper deck just behind the bridge, and measurements were made for sampling times varying between 10 min and 1 hr. Hourly concentrations of 26 and 41 micrograms inverse cu m were made in Gothenburg dock during the second hour prior to the ship's sailing, but

within half an hour of the ship putting to sea, the concentration of SO₂ had dropped to 9 micrograms inverse cu m. The general weather situation was of depressions to the west of the British Isles moving slowly northwards. While the ship was crossing the North Sea, the measurements varied between 3 and 9 micrograms inverse cu m, but as the ship sailed up the Thames, the hourly concentrations increased until 55 micrograms inverse cu m were measured when the ship docked at Tilbury. There was a light westerly wind of 1 1/2-3 1/2 m inverse sec blowing down the Thames when SO₂ concentrations were measured at 183 and 165 micrograms inverse cu m in the 2 hr prior to sailing. A concentration of 90 micrograms inverse cu m was recorded as the ship moved through the locks into the Thames, and the hourly concentrations varied between 6 and 11 micrograms inverse cu m until the ship passed the forts at the mouth of the Thames. Several short-term increases were observed as the instrument passed under the lee of other ships and of chimneys on shore. For the rest of the voyage across the North Sea, the instrument recorded hourly concentrations between 3 and 9 micrograms inverse cu m.

APTIC-23120

THE INVESTIGATION OF CARBON MONOXIDE POLLUTION IN URBAN ATMOSPHERE BY AUTOMOBILE EXHAUST GASES.

(Jidosha haigasu no issankatanso ni yoru oson no jittai chosa). Text in Japanese. Anzen Kogaku (J. Japan Soc. Safety Eng.), 9 (1):29-36, Feb. 15, 1970. 5 refs.

Yoshitaka Kobayashi, and Kazuyuki Takamatsu. Identifiers: *Highways, *Carbon monoxide, Japan, Yokohama, Urban areas, Automotive emissions, Measurement methods, Atmospheric movements.

Combustion of gasoline fuel by motor vehicles causes considerably localized contamination by carbon monoxide (CO) particularly in urban communities. The experiments for the study of vertical and horizontal distribution of CO concentration in air by the exhaust gas of automobiles at the center of an open space in the idling conditions were carried out by means of CO detector tubes. The experimental results showed a localized contamination by CO of auto-exhaust gas: the high temperature gas diffused mainly upwards without spreading and the high concentration was observed only above the vehicles. Field surveys of CO-concentration were also conducted by CO detector tube method, at several places in Yokohama city to measure the vertical and horizontal distribution. The results indicated the same tendency as the fundamental experiments and supported the results of research in many streets. The items reported were: 1) the horizontal distribution of CO concentration with the street as the center, 2) the vertical distribution of CO concentration at the roadsides, 3) the correlation between automobile traffic density and CO concentration, 4) the relationship between wind speed and CO concentration above the street, 5) CO concentration at cross-roads, and 6) the time dependence of CO concentration. The outlines of investigation of CO distribution in the atmosphere in Kanagawa prefecture for the last four years were reported: the number of investigations points was seven in addition to the twenty six points along the main roads. The highest concentration of CO was 50 ppm, the acceptable threshold for occupational exposure, and it took place at a high traffic density. The pollution ranges of CO were considered to be 20 meters outward from the street sides, showing that the pollution is of the roadside contamination type.

APTIC-23124

ON THE UNEXPECTED AIR POLLUTION AND THE CONSIDERATION OF THE CAUSE. PART II. EPIDEMIOLOGICAL RESEARCH ON THE ODOR IN TOKUYAMA CITY.

For primary bibliographic entry see Field 12.

APTIC-23149

ON THE UNEXPECTED AIR POLLUTION AND THE CONSIDERATION OF THE CAUSE. PART III. ON THE FREQUENT SMOG ALERT IN UBE CITY.

For primary bibliographic entry see Field 12.

APTIC-23150

ON THE UNEXPECTED AIR POLLUTION AND THE CONSIDERATION OF THE CAUSE. PART I. EPIDEMIOLOGICAL RESEARCH ON THE IRRITATING GASES IN NANTO-CHO.

For primary bibliographic entry see Field 12.

APTIC-23152

A COMPARATIVE SURVEY OF ATMOSPHERIC POLLEN AND FUNGUS SPORES AT TWO PLACES TWENTY MILES APART.

Acta Allergol., 25 (2-3):189-215, 1970. 36 refs.

C. Subba Reddi.

Identifiers: *Spores, *Pollens, *Air quality measurements, *India, Diurnal, Monthly, Seasonal, Asia, Non-urban areas, Urban areas, Fungi, Sampling methods, Transport, Rain.

The atmospheric concentration of different pollen and fungus spore types as measured by the catches on sticky cellophane strips exposed for 24-hour periods was studied at Anakapalle and Visakhapatnam, twenty miles apart which could be taken as representative of the rural and urban localities, respectively. At both the places the maximum atmospheric concentration of anemophilous tree pollen was found in February and to some extent in April. Weed pollen was encountered in higher concentrations during August and September, while the grass pollen incidence was greater in the period July-August. Though the fungus spores were caught all through the year, maximum incidence was noticed in February-May. Pollen from anemophilous plants preponderated the catches, the entomophilous catch being 27% at Visakhapatnam and 1.6% at Anakapalle. Tree pollen collectively and the grass pollen were equally important at Visakhapatnam. The incidence of both pollen and fungus spores was greater at Anakapalle and the variations observed in the numerical incidence and the general course of the season were found to be related to the differences in the local vegetation, proximity of the sources to the air samplers, and fluctuations in the weather. Comparison made between the catches obtained at Visakhapatnam in two consecutive years revealed the incidence of tree pollen fluctuated, while differences in the grass and weed pollen incidence were related to variations in the amount of rainfall and its distribution. Well-marked diurnal rhythms in the incidence of various pollen types were also observed. (Author summary modified)

APTIC-23154

THE DETERMINATION OF THE AMOUNT AND DISTRIBUTION OF ATMOSPHERIC SMOKE POLLUTION BY ANALYSIS OF SNOW.

Chem. Ind. (London), vol. 45:1439-1440, Nov. 5, 1955. 8 refs.

J. A. S. Gilbert, and A. J. Lindsey.

Identifiers: *Smokes, *Air quality measurements, *Snow, Great Britain, Non-urban areas, Urban areas, Domestic heating, Chromatography, Spectrophotometry, Experimental methods, Benzo (3-4)pyrene.

The distribution of atmospheric smoke over a considerable area in a short time interval was determined by a snow analysis method. The method involved removing the water from the samples, then submitting the resulting organic matter to analysis in cyclohexane solution by chromatography and spectrophotometry. The hydrocarbons pyrene, 3,4-benzpyrene, and anthanthrene were present. The areas of lowest concentration were well away from smoke polluting influences. The highest levels were in areas like the city of London, where heavy domestic heating is common. The meteorological conditions at the time of the experiment had an influence on the distribution of the contaminants. The experimental method and conditions are described.

APTIC-23198

QUANTITATIVE CONTENT OF MICROORGANISMS IN HIGH ATMOSPHERIC LAYERS. *Mikrobiol. Zh. (Kiev)*, 22 (6):77-81, 1960. 15 refs. Translated from Russian. Foreign Technology Div., Wright-Patterson AFB, Ohio, Translation Div., Sp., Feb. 26, 1970. CPSTI, DDC: AD 703489 Ya. G. Kishko.

Identifiers: "Lower atmosphere, "Microorganisms, "Air quality measurements, "User, Aircraft, Sampling methods, Altitude, Clouds, Humidity.

Bacteriological investigations of high altitude air were conducted from May to September 1967. Air samples were collected by mounting a collector in which a Petri dish with nutrient medium was placed in the window of an LI-2 sounding aircraft. Twenty-five flights were made under various meteorological conditions. The greatest number of microorganisms was found in the first 500 m of air adjoining the earth's surface. The quantity of microorganisms decreased by eight times at an altitude of 3000 m and by more than 100 times at an altitude of 7000 m. A definite relationship was observed to exist in the upper layers of the atmosphere between humidity and microorganism content: the drier the air, the fewer the microorganisms contained in it. Clouds include large quantities of microorganisms.

APTIC-23208

THE DISTRIBUTION OF SURFACE CONCENTRATIONS OF SULPHUR DIOXIDE EMITTED FROM TALL CHIMNEYS.

Phil. Trans. Roy. Soc. London, Ser. A, 265 (1161):245-259, Nov. 13, 1969. 12 refs. D. J. Moore.

Identifiers: "Electric power production, "Air quality measurements, "Sulfur dioxide, Diurnal, Hourly, Great Britain, Stack gases, Stacks, Computer programs, Mathematical modeling, Plume behavior, Winds.

A method using a computer to plot out sulfur dioxide concentration distributions is employed to process data from two power stations for the period Nov. 1964 to May 1966. The mean values of the hourly concentration are discussed in terms of the concentration expected from the simple Gaussian model, having first divided the measurements into groups of approximately equal wind speed, station load, and time of day. The observed mean values of the maximum hourly average surface sulfur dioxide concentration from generating station plumes (stack height 100 m and above) exhibit a marked dependence on wind speed. At night, the lowest concentrations occur in light winds, and the concentration increases almost linearly with wind speed up to speeds of 14 m/s at stack top. In the daytime, the lowest concentrations occur at about 4/s with a secondary maximum in light winds. The distributions of the individual hourly average values in both light and strong winds are discussed and some practical methods for predicting these distributions are suggested. The variations with distance from the source of the axial concentration, crosswind standard deviation and the concentration integrated across wind are discussed in terms of departures from the isotropic Gaussian concentration distribution. The methods outlined could be used to assess measurements for other geographical situations and different sorts of environments (urban areas and countryside). Processed topographical features would necessitate special treatment. (Author abstract modified)

APTIC-23235

BENZOPYRENES AND TRACE ELEMENTS IN THE ATMOSPHERE OF A LARGE CITY.

(Benzopyrene und Spurenelemente in Grossstadtluft). Text in German. Intern. J. Air Water Pollution (London), vol. 8:185-191, 1964. 6 refs. H. O. Hertke.

Identifiers: "Benzopyrenes, "Gravimetric analysis, Seasonal, Respiratory diseases, Germany, Urban areas, Dusts, Fly ash, Trace analysis, Particulate sampling, Antimony compounds, Beryllium compounds, Chromium compounds, Cobalt compounds, Copper compounds, Manganese compounds, Molybdenum compounds, Nickel compounds, Titanium compounds, Vanadium compounds, Zinc compounds.

Airborne dust was collected in the streets of Hamburg over a 19-month period, and the weights of dust, ash, benzopyrenes, and trace elements were determined by gravimetric analysis. During 1962 there was an average of 0.217 g of dust per 1000 cubic meters, 0.106 g of which was soluble in methanol. The amount of 3,4-benzopyrene was 100 micrograms, 76 micrograms of 1,2-benzopyrene, with widely divergent figures between summer and winter for 3,4-benzopyrene: 17 and 183 micrograms, respectively. A maximum dust content of 388 micrograms was reached during January 1963, when the temperature was -4.8 C. Dust samples contained 2 mg lead for each 1 mg of zinc and copper, 0.5 mg titanium, and 0.2 mg manganese. The content of vanadium, nickel, chromium, antimony, and cobalt were in the range of 0.1-0.01 mg, with lesser quantities of molybdenum and beryllium. Seasonal variations are discussed, and concentrations are compared with those obtained in other locales. The literature on the relationships between benzopyrene and trace element concentrations and respiratory illnesses is reviewed.

APTIC-23248

MEASUREMENT OF ATMOSPHERIC ION DENSITY. SOUTHERN WASHINGTON.

American Inst. of Medical Climatology, Philadelphia, Pa., Proc. Intern. Conf. Ionization Air, Philadelphia, Pa., 1961, 1 (10): Sp. 6 refs. (Oct. 16-17.)

A. G. Corrado, W. E. Cawley, and R. G. Clark. Identifiers: "Richland, "Air quality measurements, "Ions, Monthly, Washington (state), Asthma, Particle counters, Atmospheric movements, Pressure (atmospheric), Temperature (atmospheric).

Measurement of natural atmospheric ions without weather or human response correlation are reported. These studies were done from August 1960 to May 1961 at Richland, Washington, which is at an altitude of four hundred feet above sea level. Climatic factors for this area are mentioned. Equipment comprised an ion collector, and electric heater, shielded lead, and the battery and control box. Measurements were made on two separate Beckman micro-micro ammeters, one for the positive and the other for negative ions. These measurements were then recorded on a Minneapolis-Honeywell four point recorder which printed charges of one polarity every twenty seconds for eight succeeding measurements, then reversed and printed eight of the opposite polarity. All ions up to the so-called intermediate ions were monitored, or those ions with a mobility greater than 0.02 cm/sec/volt/cm. For the period measured, the average number of negative ions was 700 ions/cc and the average number of positive ions, 720 ions/cc. Readings made in January, February, and September showed that the changes in ion concentration were less variable than those taken during August, October, and April. The months showing the highest incidence of bronchial asthma are also those showing the greatest variability in ion levels. On many occasions, cold fronts were accompanied by or preceded by rapid changes in ion levels. Vapor pressure was evaluated and this suggests an inverse relationship to ion density levels.

APTIC-23270

ATMOSPHERIC OZONE INVESTIGATIONS AT BARROW, ALASKA, DURING 1966, 1967. Washington Univ., Seattle, Dept. of Atmospheric Sciences, ONR Contract N00014-67-A-0103-0007,

NR 307-252, Rept. 2, 110p., Feb. 1970. 5 refs. CPSTI, DDC: AD 702747

John J. Kelley.

Identifiers: "Ozone, "Alaska, "Air quality measurements, Diurnal, Hourly, Oxidants, Continuous monitoring, Calibration methods, Ground level, Lower atmosphere, Nitrogen oxides, Sulfur dioxide.

The results of the measurements of ozone in the air at several sites in Alaska are compiled in tables. The average daily and hourly concentrations of ozone in the atmosphere near the ground are tabulated for the years 1966 and 1967. The results of the analysis of ozone measured continuously from light aircraft along several transects in northern Alaska are given. The ozone analyzer should properly be called a net oxidant analyzer, since it is also sensitive to oxides of nitrogen and sulfur dioxide; however, there is very low interference from these gases at the arctic sampling sites. The analytical method and calibration procedure for the measurements are given. (Author abstract modified)

APTIC-23282

APPLICATION OF THE METHODS OF EXAMINATION AND ANALYSIS OF COAL AND COKE PETROGRAPHY TO THE STUDY OF INDUSTRIAL DUSTS.

For primary bibliographic entry see Field 03. APTIC-23326

5. ATMOSPHERIC INTERACTIONS

METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 44. ANALYSIS OF TURBULENT BOUNDARY LAYER (II).

Taiki Ozen Kenkyu (J. Japan Soc. Air Pollution), 2 (1):70-77, 1967. Translated from Japanese. 2p. Toshio Chaki.

Identifiers: "Mathematical analyses, "Stability (atmospheric), "Turbulence (atmospheric), Japan, Lower atmosphere, Diffusion, Winds, Neutral condition.

In the turbulent boundary layer, the vertical distribution of the wind speed is represented by the logarithmic and linear type law. The thickness of the boundary layer is 30 m to approximately 300 m, and is connected with the atmospheric stability. It is thickest in the neutral atmosphere and thin in the stable and unstable atmosphere. The turbulence intensity of the atmosphere in the boundary layer becomes larger as the layer approaches the ground. The vertical distribution roughly conforms to the logarithmic law. The value of the turbulence intensity is affected by the atmospheric stability. The ratio of the turbulence intensity for 1 minute to the average wind speed exceeded 0.10 in the unstable atmosphere. The atmospheric diffusion coefficient, obtained from this ratio, showed a tendency to be proportional to the square of the surface wind speed.

APTIC-17719

METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 47. ANALYSIS OF THE DOWN-DRAFT BY MEANS OF WIND-TUNNEL EXPERIMENTS.

Taiki Ozen Kenkyu (J. Japan Soc. Air Pollution), 2 (1):70-77, 1967. Translated from Japanese. 3p. Rikits Inoue, Satoshi Nakajima, and Yasushi Ogawa.

Identifiers: "Smokes, "Simulation, "Turbulence (atmospheric), Japan, Stack gases, Stacks, Photographic methods, Testing facilities, Diffusion, Winds.

Turbulence intensity in the case of average wind speeds of 0.5, 1.0, 1.5, and 2.0 m/s at several places leeward of the turbulence lattice was measured. A miniature-type low velocity diffusion wind-tunnel was used. The results were analyzed with respect

to mode of decay of the turbulence intensity, self-correlation coefficient, and spectrum distribution. The mechanism of the down-draft in a simple building model was also investigated on the basis of these data. The chief items that were analyzed included the distribution of the average wind speed on the lee of a building and photographic analysis of the types of smoke.
APTIC-17722

ABSORPTION OF SULFUR DIOXIDE FROM AIR.

Ind. Eng. Chem., 50 (8):1169-1172, Aug. 1958. 21 refs. (Presented at the American Chemical Society 132nd Meeting, Symposium on Air Pollution, New York, Sept. 1957.)

H. F. Johnston, and D. R. Coughanovr.
Identifiers: "Droplets," "Catalytic oxidation," "Absorption (general)," "Sulfur dioxide, Fog, Sulfuric acid, Catalytic activity, Photooxidation, Reaction kinetics.

The rate of sulfur dioxide oxidation in drops of catalyst solutions suspended in air was studied and compared with the rate of SO₂ absorption and oxidation by drops containing hydrogen peroxide. The rate of formation of sulfuric acid in a drop of catalyst solution suspended in air containing SO₂ depends on the partial pressure of SO₂ and the nature and concentration of the catalyst. As the concentration of sulfuric acid in an acid droplet increases with the inverse cube of the diameter as the droplet evaporates in air of low humidity, and the initial fog droplets are one or two orders of magnitude larger than the droplets formed by the photochemical oxidation, the residual acid droplets formed by the catalytic reaction in fog are probably larger than those formed by photochemical oxidation.
APTIC-19642

THE INADVERTENT MODIFICATION OF THE ATMOSPHERE BY AIR POLLUTION.

Bull. Am. Meteorol. Soc., 50 (4):199-206, April 1969. 16 refs.

Vincent J. Schaefer.

Identifiers: "Particulates," "Weather modification," "Nucleation, Urban areas, Automotive emissions, Aerosols, Dusts, Smokes, Clouds, Rain, Snow, Cloud seeding, Inversion, Lead compounds, Particle growth.

There has been a noticeable increase in air pollution over and downwind of the several large metropolitan areas of the United States. The worst accumulation of particulates occurs at the top of an inversion which intensifies at night, 1000 to 4000 feet above the ground. These particulates may modify the weather conditions of the affected area by entraining cloud droplet nuclei, so that rain does not develop. Over the past several years, rain and snow storms in some areas have consisted of small precipitation particles. When collected on plastic sheets, the precipitation consisted of badly polluted water. Auto exhaust may account for the high concentration of ice crystals observed downwind of the large cities. When iodine reacts with the lead in exhaust gases, a nucleating zone for ice crystal formation is formed. If pollution sources lead to increased dustiness from ill-used land, more cloud nuclei from burnish trash, and more ice nuclei from the lead permeated exhaust of internal combustion engines, not only will the advantage of extracting additional water from the sky be lost, but there may be a drastic change in U. S. climatological patterns.
APTIC-19058

'ALL OTHER FACTORS BEING CONSTANT...': A RECONCILIATION OF SEVERAL THEORIES OF CLIMATIC CHANGE.

Weatherwise, 21 (2):56-62, April 1968. 6 refs.

Reid A. Bryson.

Identifiers: "Temperature (atmospheric), Volcanoes, Dusts, Turbidity, International, Carbon dioxide, Infrared radiation, Solar radiation.

While the mean temperature of the earth can be altered by changes in solar intensity, reflectivity, or 'effective emissivity' of the earth for infrared radiation, the latter factor is now dominant and responsible for the temperature decline of the last decade or two. Increases in the 'effective emissivity' are attributed to increases in volcanic dust and to increasing global air pollution involving man-made dust. The increased atmospheric 'dustiness' or turbidity is making the earth cooler by scattering away more incoming sunlight. Increased solar output or increased atmospheric carbon dioxide would cause world temperatures to rise.
APTIC-19127

ATMOSPHERIC VERSUS GROUND LEVEL SAMPLING FOR DUST DRIFT RESIDUES.

Preprint, p. 70-78, 1965 (7).

George B. MacCoblen.

Identifiers: "Pesticides," "Sampling methods," "Ground level," "Diffusion, Cattle, Orchards, Crop spraying, Propeller aircraft, Gas sampling, Source sampling, Lower atmosphere, Tractors, Transport, Winds, Inversion, Topographic interaction.

The effects of weather, topography, and formulation on the drift movement of agricultural toxicants dusted on orchards from aircraft are considered in relation to the problem of toxicant residues on dairy animal forage. Data are presented demonstrating the downwind and downslope drift of dusts along with explanations of the manner in which the data were collected. Differences between air sampling results and ground sampling results and their relative merit are discussed. The spread of these pesticides was enhanced by the presence of meteorological inversions and wind. This constitutes a problem when, as in the Vermont area under consideration, dairy animal pastureland is adjacent to or in proximity to the orchards being sprayed. Since no argument could be established to the effect that the dusting was unnecessary, it was recommended that the dusting be accomplished during such times when the wind velocity is below 5 mph and when no inversion condition exists.
APTIC-19596

INTERSTATE TRANSPORT OF AIR POLLUTION IN SOUTHWESTERN CONNECTICUT.

Preprint, Connecticut State Dept. of Health, Hartford, Air Pollution Control Section, 94p., Oct. 30, 1969. 27 refs.

Robert J. Ball.

Identifiers: "Connecticut," "Particulates," "Transport, Seasonal, Diffusion, Winds, Wind rose, Sulfur dioxide.

Transport parameters were derived for sulfur dioxide and particulates in southwestern Connecticut from radiosonde, pilot balloon, and surface observations. Excessive air pollution buildup within New York City's nocturnal, urban-boundary-layer envelope (heat island effect) does not significantly contribute to southwestern Connecticut's pollution at night, with the exception of those occasions when the wind direction is from the southwest causing an elongation or displacement of the envelope toward the northeast. Particulate concentrations ranged from 64 to 205 micrograms/cu in the daytime, while at night concentrations ranging from 58 to 135 micrograms/cu m were noted. Crosswind-concentration profiles derived from the pollution-ventilation-wind rose were used with sector type diffusion equations to estimate daily particulate flux passing through southwestern Connecticut on southwesterly winds, and the total flux was several times higher than that generated in the entire state on a typical summer day. A background cumulative frequency distribution was simulated by reducing the flux from the easterly sectors to the natural background level, and this distribution alone exceeded Connecticut's air quality standard. A cumulative frequency distribution of SO₂ indicates that concentrations greater than 0.08 ppm are never reached. Particulate flux entering Connecticut on southwesterly winds causes very high con-

centrations generally throughout the entire state, and the frequency of occurrence is particularly high in the summer.

APTIC-19738

RELATIONSHIP BETWEEN THE ELECTRICAL FIELD OF THE ATMOSPHERE AND NUCLEI OF CONDENSATION.

In: Electricity of the Free Atmosphere (Results of Measurements During the IGY and MGC). (Elektrichestvo svobodnoy atmosfery (rezul'taty izmereniy vo vremya MGI i MGC). Leningrad, Glidrometeorologicheskoye Institut' stro 1965, Chapt. 6, p. 74-82, 177-178, 180-182. 9 refs.

Translated from Russian. Foreign Technology Div., Wright-Patterson AFB, Ohio, Translation Div., 9p., Aug. 21, 1968. CPSTI, DDC: AD 685307 I. M. Ilyanov, and Ye. V. Chubarina.

Identifiers: "Electric field strength," "Condensation nuclei," "Mathematical analyses, Near, Lower atmosphere, Middle atmosphere, Electricity (atmospheric), Condensation (atmospheric), Inversion, Nucleation, Dispersions, Electric charge.

Data on electric field strength of the atmosphere and the concentration of condensation nuclei that were obtained in 25 aircraft soundings were mathematically analyzed to determine the relationship between electric field strength and nuclei concentration up to 2.5 km. The presence of a close relationship was established. In those cases where exponential decreases of field strength and concentration of nuclei were observed, coefficients in the exponents of corresponding formulas are close to one another in value. The connection between field strength and concentration of nuclei is due to changes in the conductivity of air. This makes it possible to estimate average dimensions of nuclei. Height distribution curves of electric field strength and the concentration of condensation nuclei were also plotted according to data obtained from 27 flights made in midsummer. The curves are very similar to one another; both electrical field strength and condensation nuclei show maximums at 500-700 m. The maximum vertical distribution of both nuclei and electric strength are greatly influenced by inversions and the intercepting layers connected with them.
APTIC-19740

SOME OBSERVATIONS ON THE ATMOSPHERIC DIFFUSION FORMULAE EMPLOYED IN CANADA.

(Canada ni okeru taikikakusanishiki ni tsuite no kangae). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 6 (7):427-433, July 1970. 21 refs. Yukikazu Takabayashi.

Identifiers: "Mathematical modeling," "Diffusion," "Stack gases, Japan, Height finding, Flame behavior, Temperature, Stability (atmospheric), Turbulence (atmospheric).

Factors such as meteorology and topography have a large influence on the spread and diffusion of plumes. The atmospheric dilution of flue gases is generally considered to occur in two stages, the rising of the plume and its diffusion. The plume takes an arbitrary motion downwind and reaches an effective height. Then, horizontal and vertical diffusions occur with the result that the plume eventually reaches the ground level. The process of diffusion has been quite extensively studied, but not the upward motion of the plume, with which this paper is concerned. Rising of the plume depends on buoyancy, momentum, and the plume diameter, while the plume initially shows a jet stream type behavior within the range of 0-300 meters, if the flow is fast enough. The second stage consists of the accelerated diffusion where the general outline of the plume becomes vague, the plume having lost its initial heat capacity and vertical momentum. The last stage, about 1200 meters downwind, occurs when the plume has lost its momentum and buoyancy, and the rate of upward motion becomes constant or the minimum. Different mathematical approximations for the final plume height are given. In addition, formulae for

approximating the maximum ground level concentration downwind from the source are introduced for different meteorological conditions such as temperature gradient, atmospheric stability, turbulence, and the existence of inversion layers. The main point lies in the fact that based on the above formulae with appropriate correction factors, the effective heights of smokestacks can be calculated, given the emission standard and other pertinent data at the source.
APTIC-19827

COSMIC-RAY-PRODUCED SODIUM 24 AND OTHER NUCLEIDES IN THE LOWER ATMOSPHERE.

J. Geophys. Res., 75 (15):3033-3038, May 20, 1970. 18 refs.

Walter Roedel.

Identifiers: *Diffusion, *Isotopes, *Radioactive radiation, Germany, Radiation measuring systems, Mathematical analyses, Ground level, Lower atmosphere, Beryllium compounds, Sodium compounds.

The concentration of cosmic-ray-produced Sodium (24) (15 hours half-life) in the lower atmosphere was calculated and measured, and the production rate of this nuclide was estimated. The distribution of the specific activity was calculated for different sets of vertical eddy diffusion parameters. The concentration of Sodium (24) in the lower layers of the troposphere is sensitive to vertical eddy diffusion coefficients in the range of about 50,000 to about 3,000,000 sq cm/sec; at altitudes above 4 or 5 km, the sensitivity of the Sodium (24) concentration to eddy diffusion strength decreases. Several measurements of Sodium (24), Sodium (22), and Beryllium (7) in ground-level air were carried out. Some measurements of Sodium (24) in rain-water samples were carried out. Measurements suggest that short-lived cosmic-ray-produced nuclides are useful as tracers for atmospheric motions for a wide range of eddy diffusion parameters in the lowest 4 or 5 km of the troposphere. (Author abstract modified)
APTIC-20996

PRODUCTION AND DIFFUSION OF NITRIC OXIDE.

J. Geophys. Res., 75 (22):4307-4321, Aug. 1, 1970. 54 refs.

D. F. Strobel, Huntea D., and M. and.

Identifiers: *Transport, *Nitric oxide (no), *Photochemical reactions, Mathematical modeling, Upper atmosphere, Diffusion, Nitrogen, Dissociation, Recombination, Photoionization, Reaction kinetics, Ions.

The photochemistry and transport of nitrogen and nitric oxide are studied by means of a program incorporating molecular and eddy diffusion. The sources considered are ionospheric, and metastable reactants are included to match the large observed NO concentrations. With (02 (1 Delta)) a satisfactory result can be obtained, but only with a rate coefficient two orders of magnitude larger than suggested by Norton. The N (2 D) is also satisfactory, and the required rate constants have some laboratory support. The N (2 D) is taken to be produced by dissociative recombination of ionic NO, and the yield is required to be between 0.5 and 0.6; the NO₂ concentrations are very sensitive to the exact value in this range. An important new source N (assumed to be ground state) is introduced: dissociation of N₂ by photoelectrons. The yield of N (2D) in ionic NO recombination must then be near unity. A possible consequence is an inverse dependence of D-region electron density on solar activity. Nitric oxide is determined by quite different factors during the polar night, and much larger concentrations are possible. (Author abstract modified)
APTIC-22166

DETERMINING THE INFLUENCE OF THE CITY ON THE OZONE CONTENT OF THE AT-

MOSPHERE AS A FUNCTION OF WIND DIRECTION.

(Zur Nachweis der Stadteinflüsse auf den Ozongehalt der Luft mittels seiner Windrichtungsabhängigkeit). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 33:117-128, 1970. 4 refs.

Walter Fott.

Identifiers: *Urban areas, *Ozone, Annual, Monthly, Seasonal, Germany, Ground level, Winds.

The ozone content of the ground level atmosphere in Dahlem, a Berlin suburb, is strongly dependent on wind direction. Comparison with the ozone figures for the atmosphere above Berlin-Tempelhof (hub of city) shows that this directional orientation differs somewhat from what would normally be expected, leading to the conclusion that the ozone content is notably reduced by the presence of the city. Figures were compared on an annual basis, and also by the season and by the month.
APTIC-22331

THE DIFFUSION OF AIR POLLUTANTS INTO THE LOWER LAYERS OF THE ATMOSPHERE.

(Die Ausbreitung luftfremder Stoffe in den untersten Schichten der Atmosphäre). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 30:9-12, 1970. 7 refs.

W. Klug.

Identifiers: *Mathematical analyses, *Lower atmosphere, *Diffusion, Germany, Stacks, Height finding, Ground level, Meteorology, Topographic interactions.

A formula is described and discussed which relates the emission of pollutants from a punctiliar, continuously emitting source to meteorological conditions and the concentration of pollutants at a point leeward to the source. The formula is based on a number of assumptions, such as a perfectly flat terrain, wind velocity and direction constant in time, turbulence constant in space, intensity of source constant in time, zero vertical velocity, an absence of chemical, physical, or photochemical changes in the emitted material, and perfect reflection on the pollutants by the ground. Problems of applying the formula are reviewed, especially as regards derivation of the dispersion factors, which can be calculated either by a semi-empirical method or entirely on the basis of experimental values. There are as many as 30 different formulas (theoretical, semi-theoretical, and empirical) for the calculation of stack height. Further problems have to do with allowances for a complicated topography, the effect of high buildings, and similar topics.
APTIC-22332

THE RATE OF REACTION BETWEEN DILUTE HYDROGEN SULFIDE AND OZONE IN AIR.

Atmos. Environ. (London), 3 (6):657-667, Nov. 1969. 6 refs.

Jeremy M. Hales, James O. Wilkes, and J. Louis York.

Identifiers: *Ozone, *Hydrogen sulfide, *Oxidation, Odors, Sulfur dioxide, Chemical sulfide, Chemical reactions.

Gas-phase oxidation by ozone is believed to be an important factor in the removal of atmospheric hydrogen sulfide. In addition, this reaction is thought to be significant in some odor control processes involving hydrogen sulfide and organic sulfur compounds. Since little is known about the mechanism of the reaction, experimental data on the rate of reaction between dilute hydrogen sulfide and ozone in air were obtained from two tubular, laminar-flow reactors. Internal diameters of the reactors were 3/8 in. and 1/4-in. Production of sulfur dioxide by the reaction between hydrogen sulfide and ozone was measured at 28.5 °C and 48 °C. Results from the reactors at 28 °C, when computed as homogeneous reaction rates, fell on the same curve within the limits of experimental error.

From this it is concluded that the observed data represented an almost totally homogeneous reaction. Linear regression performed on the results at 28 °C showed the reaction orders to be 0.495 and 1.562 in hydrogen sulfide and ozone, respectively. On the basis of the total results, an expression was derived for the rate of generation of sulfur dioxide by the reaction of hydrogen with ozone in the absence of light, the expression also representing the rate of depletion of hydrogen sulfide and ozone. From the results of previous authors, the expression $H_2S + O_3$ to yield $SO_2 + H_2O$ is thought to represent the true stoichiometry adequately under the experimental conditions of the study.
APTIC-22335

A COMPARISON OF THE SPECTRAL DISTRIBUTION OF SOLAR RADIATION IN A POLLUTED AND A CLEAN AIR MASS.

J. Air Pollution Control Assoc., 20 (8):546-547, Aug. 1970. 9 refs.

Darryl Randerson.

Identifiers: *Spectrometry, *Solar radiation, Houston, Urban areas, Fuel oils, Primary metallurgical processing, Hydrocarbons, Ozone, Photochemical reactions, Light scattering.

Two spectroradiometer measurements are presented to illustrate differences in the spectrum of sunlight in the 0.45-0.7 micron band. Measurements were taken on a November day at about 1800 GMT, west of polluted downtown Houston, and at another site located approximately 15 miles NW in apparently pollution-free air. A 23-24% loss in the 0.45-0.7 micron band is attributed to attenuation by airborne particulates in the polluted air mass. The loss is wavelength dependent, with the short wavelengths being scattered more than the long wavelengths. Absorption by ozone was probably occurring in the Chappuis bands, between 0.45 and 0.65 micron; however, O₃ absorption in these bands is weak. Large quantities of hydrocarbons emitted by oil refineries in the Houston-Galveston area are noted to combine with rush-hour automotive exhaust emissions to create a potential for O₃ formation when the sunlight is intense enough for rapid photochemical reactions. Consequently, some of the loss in radiant energy may be due to absorption through photochemical losses in the polluted air mass. When light depletion persists for two or three days, a physiological response probably occurs in plants and animals.
APTIC-22339

SURFACE ACTIVE ORGANIC MATERIAL IN THE MARINE ATMOSPHERE.

J. Geophys. Res., 75 (24):4561-4566, Aug. 20, 1970. 17 refs. (Presented at the American Chemical Society National Meeting, 159th, Houston, Tex., Feb. 1970.)

W. R. Barger, and W. D. Garrett.

Identifiers: *Oceans, *Hydrocarbons, *Surfactants, Particulates, Ground level, Lower atmosphere, Transport, Sea breeze, Fog, Haze, Surface properties.

Constituents of the marine atmosphere, were collected on shallow trays exposed to onshore winds on the windward coast of the Island of Oahu. Upon addition of distilled water to the trays, the collected materials formed organic monomolecular films on the water surface, and the curves for film pressure versus area for these films were determined at the field site. The monolayer studies indicated the presence of weakly surface-active organic compounds and hydrocarbons as well as strongly adsorbed, highly polar species. Simultaneous collections of oceanic particulate matter were made with a high-volume air sampler with glass fiber filters. The organic material was extracted from the filters with chloroform and analyzed for specific fatty acids by gas chromatography. The ratios of the quantities of the principal fatty acids found in the air samples were similar to previously reported fatty acid ratios from the sea

surface samples collected at the air-sea interface. The ocean appears to be a major source of air-borne maritime organic matter. The implications of these data to sea fog and haze stabilization are discussed. (Author abstract modified)
APTIC-22404

RECENT THINKING ON THE CHEMICAL FORMATION OF AEROSOLS IN THE AIR BY GAS PHASE REACTIONS.

Aerosol Sci., vol. 1:127-133, 1970. 11 refs.

K. G. Vohra, and P. V. N. Nair.

Identifiers: *Gases, *Chemical reactions, *Aerosols, Asia, Nuclear power plants, Atmospheric phenomena, Humidity, Hydrochloric acid, Nitric acid, Sulfuric acid, Chlorine compounds, Nitrogen oxides, Sulfur dioxide, Ozone, Oxidation, Recombination, Photoionization, Solar radiation, Nucleation, Particle growth, Water.

Possible mechanisms of formation of aerosols in the air by chemical reactions in the gas phase are described. In the basic reactions, formation of hydrochloric acid, sulfuric acid, and nitric acid molecules from chlorine, sulfur dioxide and oxides of nitrogen, in the presence of water vapor, are considered along with the role of solar radiations, ionizing radiations, electric discharges and ozone in the formation of these acids. Formation of nuclei by the hydration of acid molecules and their reaction with other organic and inorganic trace gases are also discussed. The reactions important in the formation of Aitken nuclei and aerosols are mainly oxidation, hydration, acid-base reactions and addition and recombination reactions. In these reactions, the combined role of solar and ionizing radiations are considered. The formation of embryos and growth of particles in the humid air are discussed on the basis of Raoult's law. The important role of chemically formed particles in the atmospheric processes and the possible impact of nuclear power production on the nuclei content of the atmosphere are suggested. (Author abstract modified)

APTIC-22407

DUST DEVIL PROPERTIES.

J. Geophys. Res., 75 (24):4583-4585, Aug. 20, 1970. 4 refs.

W. D. Crozier.

Identifiers: *Dust devils, *Electric moment, *Electric charge, Plains, Dusts, Photographic methods, Ground level, Winds, Density, Electrical properties.

After a more or less accidental recording of the electric field of a dust devil, or desert whirlwind, two intentional studies were carried out to make more and better observations. Two 16-mm cameras using a combination of deep-red and polaroid filters were operated at the ends of a 50-meter base line. The site of the observations was a semidesert mesa in New Mexico. Location, potential gradient, and electric moment are reported for 17 dust devils. In addition, size information, ground speed, and estimates of charge and charge density are presented for some of the 17. Charge densities appear generally to be of the order of 0.000001 elementary charges reciprocal cu cm. Electric moments were observed to vary considerably with time during the life of a dust devil. Ground speeds ranged from 5-11 m reciprocal sec, and the measured speeds suggested that the translational motion of the dust devil is largely derived from the general wind field in which it is immersed. Since dust densities at great heights were comparatively small, it is concluded that most of the electric charge resides at lower levels. Nevertheless, the charge at high levels, because of greater moment arm, may contribute significantly to the electric moment.

APTIC-22409

AIR POLLUTION'S RELATIONS TO METEOROLOGY.

(A levegőszennyezés meteorológiai vonatkozásai). Text in Hungarian. Energia Atomtech. (Budapest), 23 (5):215-222, 1970. 9 refs. Dezso Szepesi.

Identifiers: *Air pollution forecasting, Europe, Urban areas, Smog, Mathematical modeling, Point sources, Winds, Stability (atmospheric), Topographic interactions.

Meteorological quantities of air pollution implicate altitude wind, stability parameter, thickness of the mixing layer, and the number of 'Degree-days of heating' (C room-temperature multiplied by days/year of heating). These quantities are available for the City of Budapest and used in the paper as examples. The above four quantities, the 'background load' of pollutants and the emission characteristics of significant point-sources of pollutants will define the actual pollution load at a particular location, as a function of time. There are a few physical characteristics of the load calculation that had not been adequately defined, especially the roughness parameter of the terrain. This latter depends on the vertical profile of the area and the degree of coverage by buildings. Investigations are underway (both in Hungary and abroad) to obtain mathematical expressions for the roughness parameter. When the investigations are completed, air pollution forecasting for cities will be possible, and even smog formation will be predictable from meteorological data.

APTIC-22417

THE DEPENDENCY OF THE DIFFUSION CONDITIONS OF AIR POLLUTANTS ON METEOROLOGICAL PARAMETERS.

(Die Ausbreitungsbedingungen von Luftverunreinigungen in Abhängigkeit von meteorologischen Parametern). Text in German.

Arch Meteorol. Geophys. Bioklimatol. Ser. A (Vienna), 19 (2):173-186, 1970. 6 refs.

Heinz Reuter.

Identifiers: *Mathematical analyses, *Air pollution forecasting, *Diffusion, Europe, Ground level, Winds, Temperature gradient.

A programmed specification for 7 diffusion classes of air pollutants based on the radiation index and wind velocity in knots, designed to serve as a guide for the prediction of the dispersion of airborne effluents, is described. For each diffusion class, a characteristic dependence of the horizontal and vertical standard deviation of the spreading gas on diffusion time was determined empirically by Pasquill. Numerical approximations of the empirical curves as well as the determination of the site of maximal emission on the ground as a function of the effective height of the source of the emitter, together with frequency distributions of the diffusion classes in different areas demonstrate the applicability of the method. The method as presented has a number of shortcomings stemming from the loose relationship of the diffusion classes with the vertical temperature gradient of the vertical wind shear or with composite parameters like the Richardson or the Rayleigh number.

APTIC-22422

STUDY OF PROPAGATION OF ATMOSPHERIC POLLUTANTS WITH THE AID OF TRITIUM.

(Untersuchung der atmosphärischen Ausbreitung mit Hilfe von Tritium). Kerntechnik, 12 (5-6):212-218, 1970. 13 refs.

H. Kiefer, L. A. Koenig, and M. Winter.

Identifiers: *Diffusion, *Plume behavior, *Radioactive tracers, Germany, Stack gases, Winds, Stability (atmospheric).

Atmospheric diffusion of pollutants was studied at the Karlsruhe Nuclear Research Center by releasing tritium in the course of a reactor operation in a pre-set controlled manner. The tritium activity was admixed to the exhaust air either by spraying tritiated water into the stack under pressure or it

was evaporated by controlled boiling. Both in routine monitoring and in systematic studies of the atmospheric propagation of tritiated water vapour, emission measurements were based on sampling in the vicinity of the emitting source by freezing out the moisture from atmospheric air by liquid air or dry ice and by determining the tritium activity concentration $C_{sub F}$ in the air moisture with a liquid scintillation spectrometer. The choice of appropriate sampling locations decisive for the success of a propagation experiment was made at the latest possible time to take into account the latest data on wind direction and velocity. All experiments were carried out under meteorological conditions of stability classes C or D as defined by Pasquill, i.e., on days of steady wind velocity and direction. The results obtained under these conditions agreed with values calculated from the generalized Gauss formula within a factor of 2.

APTIC-22424

A NUMERICAL MODEL OF WARM FOG DISPERSION BY HYDROSCOPIC PARTICLE SEEDING.

J. Appl. Meteorol., 9 (4):627-633, Aug. 1970. 20 refs.

Bernard A. Silverman, and Bruce A. Kunkel.

Identifiers: *Mathematical modeling, *Dispersion, *Fog, *Cloud seeding, *Droplets, Visibility, Particle size, Temperature (atmospheric), Turbulence (atmospheric), Sodium chloride, Hygroscopicity.

A numerical model has been developed which simulates the modification of warm fog caused by the condensation-coalescence growth of monodispersed hygroscopic particles introduced into the top of a fog layer. With this model, the effects of the quantity and size of sodium chloride particles on the visibility in fogs of various drop size spectra and liquid water contents were determined. The results show that the optimum seeding particle radius is approximately 10 microns. For fogs with a relatively high turbulence level where time is an important factor, particles greater than 10 microns may be necessary. To achieve the same visibility improvement, the seeding rate is directly proportional to the fog liquid water content and inversely proportional to the fog drop size. Because of the large payloads and dispensing rates required, the results indicate that there is no advantage in using saturated solution droplets instead of dry particles. (Author abstract modified)

APTIC-22527

DIFFUSION OF EXHAUST FUME (ON INHIBITION OF AIR POLLUTION).

(Haien no kakusan ni tsuite (taiki sen boshi ni tsuite)). Text in Japanese. Preprint, Japan Society of Mechanical Engineering., p. 9-18, Jan. 1970.

(Presented at the 41st Seminar, Japan Society of Mechanical Engineering, Kansai Div., Osaka (?), Japan, Jan. 28-29, 1970.)

Nobuhiro Ukeguchi.

Identifiers: *Stacks, *Mathematical analyses, *Diffusion, Abatement, Federal governments, Planning and zoning, Standards, Japan, Combustion products, Smokes, Sulfur oxides control, Stability (atmospheric), Topographic interactions, Flow rates.

Reported are the present condition of air pollution in Japan, calculation of smoke density and some future tasks. The topography of Japan allows inversion layers to capture smoke from low altitude sources. Pollution is further exacerbated by down draughts. Industrial sites must be determined to satisfy the Cabinet decision on sulfur oxides emission in 1969. In concrete terms, industrial siting should proceed in the order of 1) confirmation of present conditions 2) prediction a) out future 3) improvement, and 4) after care. This is accomplished in Mizushima district of Osaka prefecture. Ground surface density of smoke is calculated by the following process: the average wind direction and speed determine the instantaneous value of the ground surface density of smoke, which is multiplied by the coefficient of dilution to indicate the

long time average of surface density. Effective plume rise is the sum of stack height, rise due to linear momentum (H_m), and rise due to temperature difference between the gas and the atmosphere (H_t). Boussinesq's formula for calculating plume rise is introduced. In this formula, the correction coefficient (α) is multiplied to the sum of H_m and H_t . α ranges from 0.5 to 0.75 and is usually 0.65. The rising plume is exposed to wind and diffuses until it reaches the ground where it can be measured. Sutton's diffusion formula shows that in order to reduce the maximum ground concentrations, small smoke emission or large effective height of plume rise is necessary. The wind tunnel examination of smoke diffusion is very important since calculation formulas do not contain the topographical effect, down wash and down draught terms. Long-term average of smoke density is calculated by multiplying the long time correction factor to the diffusion formula or the value obtained from the wind tunnel experiment. F. J. MEAD's and Lowry's correction value are introduced.

APTIC-22533

COUNTERMEASURES TO AIR POLLUTION IN CITY PLANNING.

For primary bibliographic entry see Field 12.
APTIC-22539

A COMPARATIVE STUDY OF SURFACE-SOURCE DISPERSION AND ELEVATED-SOURCE DISPERSION.

Papers Meteorol. Geophys. (Tokyo), 20 (4):337-364, Dec. 1969. 3 refs.
Shin'ichi Sakuraba, M. Moriguchi, and I. Yamazi.
Identifiers: *Ground level, *Lower atmosphere, *Dispersion, Japan, Point sources, Tracers, Winds, Clouds, Temperature (atmospheric), Topographic interactions.

Elevated-source dispersion is compared with simultaneous source dispersion. The analysis starts from the finding that the tracer cloud height generally varies with the downwind distance. Over a complicated terrain such as Kaiwan City the Pasquill stability of elevated-source dispersion is high and that of the corresponding surface-source dispersion is somewhat lower. Over a relatively flat terrain as Oita City the Pasquill stability for an elevated source is in general low or very low under weather conditions not much different from those at the Kaiwan City experiment, while the Pasquill stability for a surface source is definitely higher, which is reverse to the dispersion over Kaiwan City. The height of tracer cloud generally increases with the downwind distance, irrespective of the elevated or the surface source. The rise of the tracer is more remarkable over a sloped terrain. The effects of wind, temperature, and topography are noted. (Author abstract modified)

APTIC-22634

THE ELECTRICAL CONDUCTIVITY OF OCEANIC AIR AND ITS CORRELATION TO GLOBAL ATMOSPHERIC POLLUTION.

J. Atmospheric Sci., 27 (5):814-819, Aug. 1970. 26 refs.
William E. Cobb, and Howard J. Wells.
Identifiers: *Conductivity, *Oceans, *Aerosols, Ground level, Lower atmosphere, Atmospheric movements, Winds, Condensation (atmospheric), Electrical properties.

The atmospheric electrical conductivity was recorded during the 1967 global expedition of the research vessel Okeanograph. Seventy-five complete days of fair weather conductivity observations were obtained and compared to earlier observations of the Carnegie Institution and others. Significant results show that the atmospheric conductivity in the remote South Pacific has remained fairly constant over the past half century but has decreased by at least 20% in the North Atlantic. The secular conductivity decrease in the North At-

lantic is attributed to an increase in the fine-particle aerosol pollution suspended in the atmosphere of the Northern Hemisphere. The influence of atmospheric aerosols, primarily in the form of condensation nuclei, on the conductivity is discussed. The observation of the conductivity in the two hemispheres are discussed with respect to the sources of pollution, the tropospheric lifetime of the suspended aerosols, and the influence of the primary atmospheric circulation. It is urged that the Carnegie measurements be repeated. (Author abstract)

APTIC-22635

ON THE MEAN PATH OF A BUOYANT CHIMNEY PLUME IN NON-UNIFORM WIND.

J. Appl. Meteorol., 9 (4):603-611, Aug. 1970. 16 refs.
C. R. Murthy.
Identifiers: *Mathematical modeling, *Winds, *Plume behavior, Canada, Diffusion, Turbulence (atmospheric), Temperature.

Based on turbulent entrainment and eddy diffusivity hypotheses, approximate theories were developed for the rise of a buoyant chimney plume in the atmospheric boundary layer. The theories incorporate wind shear effects by assuming a power law type of wind velocity profile for the boundary layer. Both theoretical alternatives lead essentially to identical results for the mean path of a hot plume in a nonuniform wind. Wind tunnel test results show fair agreement with the theoretical power law description. (Author abstract modified)

APTIC-22639

THE ATMOSPHERIC THERMAL OXIDATION OF NITRIC OXIDE IN THE PRESENCE OF DIENES.

Environ. Sci. Technol., 4 (9):752-757, Sept. 1970. 13 refs. (Presented at the American Chemical Society National Meeting, 147th, Philadelphia, Pa., April 10, 1964.)
William A. Glasston, and Charles S. Tuesday.
Identifiers: *Nitric oxide (no), *Thermal oxidation, *Dienes, Diurnal, Olefins, Nitrogen dioxide (no2), Oxidation, Photooxidation, Reaction mechanisms.

The promotion of the atmospheric thermal oxidation of nitric oxide by conjugated dienes has been suggested as being partially responsible for the nighttime conversion of nitric oxide to nitrogen dioxide in polluted atmospheres. In a study of the reaction by long-path infrared spectrophotometry, observed reactivities were found to increase in the following order: 2,3-dimethyl-1,3-butadiene, isoprene, 1,3-butadiene. The addition of nitrogen dioxide to the diol: a was the initial step in the overall reaction. The experimentally determined order of reactivity in the reaction is the same as that in the oxidation reaction. The diene-promoted photooxidation of nitric oxide was 7 to 25 times faster than the corresponding thermal oxidation. Thermal oxidation is therefore unimportant in polluted atmospheres during the day. Application of these data to typical pollutant concentrations showed that the diene-promoted thermal oxidation of nitric oxide is also unimportant at night. (Author abstract modified)

APTIC-22640

A SPATIAL MODEL OF AN URBAN HEAT ISLAND.

J. Appl. Meteorol., 9 (4):571-573, Aug. 1970. 10 refs.
R. A. Preston-Whyte.
Identifiers: *Mathematical modeling, *Temperature (atmospheric), *Heat islands, *Urban areas, Africa, Sea breeze.

Mean temperatures obtained from a 28 midday motor traverses in the Durban area during the summer of 1968-1969 show the center of the urban heat island to be displaced away from the central

business district by sea breezes. These breezes, strengthened by gradient winds, blow strongly during the summer months. A simple harmonic model was found to describe adequately the spatial distribution of the recorded midday temperatures. The model also provides for the prediction, from relatively few measuring points, of the spatial variation of temperature over the city. In addition, the model reflects the contribution of factors such as wind or steep temperature gradient to total variance about the space mean temperature.

APTIC-22646

NITROGEN DIOXIDE AND NITRIC OXIDE IN NON-URBAN AIR.

For primary bibliographic entry see Field 64.
APTIC-22654

DISPERSION PATTERNS OF AEROSOL PARTICLES IN A FREE ATMOSPHERE.

Tr. Inst. Priklad. Geofiz. (Leningrad), no. 4:5-40, 1967. 13 refs. Translated from Russian. Foreign Technology Div., Wright Patterson AFB, Ohio, Translation Div., 45p., Nov. 7, 1969. CFSTI, DDC: AD 702332
G. M. Petrova, and A. N. Miroshkina.
Identifiers: *Aerosols, *Lower atmosphere, *Dispersion, Ussr, Particle size, Turbulence (atmospheric).

A comprehensive description and analysis are presented of experimental studies of the dispersal and fallout of solid particles (luminescent sand particles, 100-1000 microns in diameter, and luminescent plastic particles, 30-100 microns in diameter) dispersed at heights of 500-8000 m in the free atmosphere and falling out at a rate of from 0.1 to 3 m/sec. The traces of the aerosol particle fallout are measured to determine the relationships between their principal characteristics (surface concentrations, positions of zones of maximum particle concentration, amount of surface concentration dispersion) and total amount of particles ejected, the wind speed, and rate of particle fallout. The information presented includes: description of experimental procedures (preparation of luminescent particles and location, description, period of operation and sizes of test sites); methods of aerological observations (pibal, aircraft); and identification and grouping of four types of atmospheric stratification. The field results are graphed, tabulated, and summarized in detail. Empirical relationships investigated relate to analysis of the practical utilization of the equation for turbulent diffusion and the coefficient of turbulent mixing in the derivation of a simple empirical equation. (Author abstract modified)

APTIC-22694

FLUORESCENT TRACER STUDIES OF POLLUTANT TRANSPORT IN THE SAN FRANCISCO BAY AREA.

J. Air Pollution Control Assoc., 29 (9):593-598, Sept. 1970. 11 refs.
James S. Sandberg, Wayland J. Walker, and Richard H. Thullier.
Identifiers: *Dispersion, *Transport, *Topographic interactions, *Urban areas, San Francisco, Non-urban areas, Diffusion, Diffusion models, Tracers, Winds, Fluorescence.

To simulate the transport and diffusion of airborne contaminants across a metropolitan region, point-source releases of fluorescent tracer material were made near various urban centers and some 50 samplers were arrayed in expected downwind directions. The effects of land-water, hill-valley, and urban-rural differences on airflow and diffusion were observed in their existing interrelationships during these experiments. Since the tracer could be assessed with high sensitivity over great distances, tracer results provided a quantitative indicator of pollutant dispersion across an extensive metropolitan complex. From July 1967 through June 1968, the test series included typical seasonal weather patterns, with emphasis on those condi-

cive to the travel and accumulation of pollutants. In each test, about 15 kilograms of tracer material were released during two-hour periods. Significant dosages were found at downwind distances up to 80 km. All tests were conducted during daylight hours to coincide better with the oxidant-type pollution important in the region. Dispersion characteristics showed much greater complexity than predictable from classical models. Built-up urban areas increased the initial dispersion rates of tracer clouds, and travel over water tended to decrease them. Hilly terrain resulted in increased dispersion but channeling associated with such terrain caused locally higher concentrations. The complex horizontal drainage pattern obtained did not confirm previously observed airflow patterns as aids in predicting pollutant distributions. (Author abstract modified)
APTIC-22826

THE SCOPE AND POSSIBILITIES OF MATHEMATICAL-METEOROLOGICAL DIFFUSION MODELS IN AIR POLLUTION CONTROL. (Aufgaben und Möglichkeiten von mathematisch-meteorologischen Diffusionsmodellen auf dem Gebiet der Luftreinhaltung). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 30:111-128, 1970. 2 refs.
H. Fortak.

Identifiers: *Diffusion models, Germany, Urban areas, Industrial areas, Stack gases, Stacks, Computer programs, Height finding, Simulation, Air pollution forecasting, Micrometeorology, Sulfur dioxide.

Mathematical-meteorological models for the turbulent diffusion of atmospheric pollution developed by theoretical meteorology are an important and economical aid in solving air pollution problems. Such models are compiled from information pertaining to every single source of pollution contributing to the atmosphere of an industrial area (including smoke stack dimensions, exit velocity of flue gas, and temperature) and from information describing the characteristics of the atmosphere, i.e., all possible climatological diffusion parameters for certain time periods. A computer with this input will calculate the emission for each desired locality within the industrial area and simulate atmospheric pollution under given weather conditions. The procedure is demonstrated on examples of short-range emission forecasting, on the calculation of emissions in an industrial area, and on calculations of the necessary smoke stack height for a planned industrial enterprise. By running such models repeatedly through the automatic control circuit of the computer, problems can be solved fast with utmost economy as demonstrated on the calculation of sulfur dioxide emission for the urban area of the city of Bremen from a register of emission sources and statistical data about meteorological diffusion conditions.
APTIC-22839

THE EFFECT OF SURFACE FILMS IN RETARDING THE GROWTH BY CONDENSATION OF CLOUD NUCLEI AND THEIR USE IN FOG SUPPRESSION.

J. Appl. Meteorol., 9 (4):639-650, Aug. 1970. 12 refs.

Identifiers: *Droplets, *Mathematical analyses, *Fog, *Cloud seeding, *Particle growth, Australia, Particle size, Adsorption, Clouds, Temperature (atmospheric), Alcohols, Hygroscopicity, Water, Vapors, Surface properties.

Equations are given for the growth by adsorption and condensation of cetyl alcohol and water vapor on a population of hygroscopic nuclei in an atmosphere being cooled at a given rate. The equations are integrated numerically for a variety of initial conditions to obtain the droplet size distribution in fogs formed in either a clean or cetyl-alcohol-contaminated atmosphere. In general, cetyl

alcohol merely serves to delay the formation of a fog for a time which depends on the quantity of cetyl alcohol used, the rate of cooling of the atmosphere, and the size distribution of the condensation nuclei present. A moderate quantity of cetyl alcohol, which for an airfield might be between 10 and 100 kg, could delay the formation of a fog for some tens of minutes. However, if cooling continues long enough, a fog will eventually form which is generally worse than it would have been without treatment. (Author abstract modified)
APTIC-22842

CASE STUDIES OF A CONVECTIVE PLUME AND A DUST DEVIL.

J. Appl. Meteorol., 9 (4):612-630, Aug. 1970. 17 refs.

Identifiers: *Dust devil, *Plume behavior, *Convection (atmospheric), Lower atmosphere, Winds.

The characteristics of a convective plume and a dust devil are described from measurements made at 5.66 and 22.6 m above a flat uniform site in Kansas. The velocity fluctuations were measured with a continuous-wave, three-component sonic anemometer and the temperature fluctuations with a fine platinum wire thermometer. The data show that the plume is basically a non-rotating system; it is more tilted in the downwind direction than the dust devil, travels at a lower velocity than the mean wind speed at 0.5 m, and requires vertical stretching for its maintenance in the presence of wind shear. The dust devil shows a downdraft in the middle, travels at a higher velocity than the mean wind at 32 m, and derives much of its stability from rotation. Both systems tend to transport momentum upward, against the velocity gradient, which probably accounts for the very low and sometimes negative stresses observed during unstable conditions. (Author abstract modified)
APTIC-22843

A COMPARISON ON THE WARM FOG CLEARING CAPABILITIES OF SOME HYGROSCOPIC MATERIALS.

J. Appl. Meteorol., 9 (4):634-638, Aug. 1970. 10 refs.

Identifiers: *Fog, *Cloud seeding, Droplets, Mathematical modeling, Temperature (atmospheric), Ammonium compounds, Chlorides, Hydroxides, Nitrates, Hygroscopicity.

The chemical properties of hygroscopic materials are evaluated to determine the desirable characteristics of an effective warm fog seeding agent. A numerical model is used to determine the relative fog clearing capabilities of the potentially effective chemicals. Hydroxides and chlorides, when dispersed as dry material, are most effective, while high solubility materials, such as ammonium nitrate are most effective when dispersed as saturated solution droplets. Many of the more effective materials are either corrosive or caustic and therefore not practical seeding agents. Of all the chemicals examined, urea and ammonium nitrate are the most practical materials since they are neither corrosive nor caustic and are relatively inexpensive. (Author abstract modified)
APTIC-22844

ON THE SOURCE AND COMPOSITION OF CLOUD NUCLEI IN A SUBSIDENT AIR MASS OVER THE NORTH ATLANTIC.

J. Atmospheric Sci., 27 (5):791-797, Aug. 1970. 11 refs.

Identifiers: *Clouds, *Nucleation, *Oceans, Sea salts, Droplets, Temperature (atmospheric), Sulfuric acid, Sulfur dioxide, Sulfates, Hydrogen sulfide.

Measurements of the concentration of cloud nuclei, which are activated at a supersaturation of

0.75%, were made aboard an aircraft at various altitudes in a subsident air mass over the North Atlantic Ocean and on the east coast of Barbados, West Indies. The measurements were made on air samples at normal temperatures as well as on air samples heated to various temperatures up to 600 C. In this way the volatility of the cloud nuclei was compared to the volatility as measured in a similar manner in the laboratory on nuclei artificially generated and of a known composition. The measurements at Barbados showed that about 50% of the cloud nuclei were nonvolatile at the temperatures used and thus were similar to artificially generated nuclei composed of sea salt; the remaining nuclei were destroyed by temperatures greater than 320 C (approx.). The aircraft measurements showed the fraction of volatile cloud nuclei to increase with altitude with all nuclei volatile above the inversion layer. These measurements indicate that in a subsident marine atmosphere only a fraction of the cloud nuclei at the sea surface are composed of sea salt, this fraction decreasing with altitude such that the sea salt nuclei are confined to the lower few kilometers. Based on the work of other investigators it is suggested that the volatile cloud nuclei are sulfates or sulfuric acid particles which result from the oxidation in the atmosphere of sulfur dioxide or hydrogen sulfide. (Author abstract modified)
APTIC-22845

A NUMERICAL MODEL FOR PREDICTING THE DIFFUSION OF SULFUR DIOXIDE IN THE ATMOSPHERE.

Texas Agriculture and Mechanical Univ., College Station, Dept. of Meteorology, Thesis (Ph.D.), Ann Arbor, Mich.: Univ. Microfilms, Inc., May 1968, 153p. 57 refs.
Darryl Randerson.

Identifiers: *Diffusion models, *Sulfur dioxide, Seasonal, Nashville, Urban areas, Lower atmosphere, Transport, Adv. section, Winds, Stability (atmospheric), Topographic interactions.

A numerical model is proposed for predicting the dispersion of sulfur dioxide over Nashville, Tennessee, during the winter. The model includes the effects of three-dimensional advection, of diffusion, and of variations in the topography. Also included in the numerical solution are the effects of chemical decay, of source strength, and of a correction term for the truncation error. A variable, vertical exchange coefficient is incorporated in the diffusive portion of the model. These terms represent the complete transport equation which is numerically integrated for a period of 2 hr in three-dimensional space. Initial conditions are based on aerometric and meteorological data acquired in Nashville, Tennessee, during the period 1938-1939. These data are used to establish the three-dimensional distribution of SO₂ and to derive a steady-state condition for the air flow and for the internal emissions of SO₂. A neutrally stable atmospheric condition is specified for a depth of 60 m. Seven different variations in the model are tested. In all cases, the predicted fields of SO₂ are aligned parallel to the air flow. One case illustrates the important role of vertical diffusion in dispersing SO₂. Another case shows that vertical advection can change local concentrations of SO₂ by as much as 20 percent of the predicted value. In 2 hr, chemical decay accounts for losses of the predicted value of SO₂ of 10 to 20 percent. The correction term dampens out the small scale oscillations of concentration which result from truncation. Predicted concentrations of SO₂ are realistic and compare favorably with observed values. The model offers a high degree of flexibility by permitting frequent changes to be made in the wind direction and speed, in the source strength, and in the atmospheric stability. The need for carefully planned and coordinated aerometric and meteorological measurements is stressed. Such observations are mandatory if physically realistic models of atmospheric diffusion are to be developed and tested. Simultaneous sampling of atmospheric pollutants and meteorological conditions is important; this is especially true for the vertical dimension. (Author abstract modified)

APTIC-22996

AN ANALYSIS OF DUST MEASUREMENTS IN THREE CITIES IN THE NETHERLANDS.

For primary bibliographic entry see Field 04.
APTIC-22911

SMOG AND WEATHER. THE EFFECT OF SAN FRANCISCO BAY ON THE BAY AREA CLIMATE.

San Jose State Coll., Calif., Dept. of Meteorology, 40p., Feb. 1967. 12 refs.

Albert Miller.

Identifiers: *Bays, *San Francisco, *Stability (atmospheric), Seasonal, Smog, Air pollution forecasting, Ground level, Lower atmosphere, Winds, Clouds, Fog, Micrometeorology, Precipitation, Temperature (atmospheric), Weather modification, Inversion, Topographic interactions.

In considering the possible effects of the filling of San Francisco Bay on the area's weather and air pollution, three basic differences between land and water surfaces are outlined: much greater temperature variation over land, greater frictional drag on the wind, and differing types and amounts of air-surface mass exchange. The existing patterns of five climatic elements—temperature, winds, precipitation, air pollution, and cloudiness—are discussed in relation to the overall atmospheric circulation and the distribution of land and water. If a major portion of San Francisco Bay were to be filled, it is conjectured that the following climatic changes could be expected. (1) Wind speeds would be decreased. (2) Temperatures would rise over the Bay area, especially in summer. Average minimum winter temperature would drop by 2 or 3 F. (3) Night-time radiation temperature inversions are likely to be more frequent and intense, causing more incidents of high pollutant concentrations. Winter fogs will be thicker and more frequent. (4) There could be some decrease in winter rainfall over the Santa Clara Valley. In addition to these effects, new buildings on the landfill would further decrease wind speeds and presumably be emitters of pollutants. It is suggested that significant climate changes of these types would be detected before 25% of the existing Bay surface were eliminated.

APTIC-22914

ATMOSPHERIC OZONE.

Minnesota Univ., Minneapolis, School of Physics, Navy Contract NONR 710 (22), TR-AP-18, 24p., Aug. 1961. 1 ref. CFSTI: AD 265411

E. P. Ney, and J. L. Kroening.

Identifiers: *Transport, *Ozone, Diurnal, Minnesota, *Quality measurements, Mathematical analyses, Ground level, Lower atmosphere, Diffusion, Temperature (atmospheric).

The detection of atmospheric ozone, using chemiluminescent detectors, is described. Values for the strength of the ozone sink, the eddy diffusion coefficient under stable and unstable conditions near the ground, and the eddy diffusion coefficient for the troposphere as a whole are determined. The presence of ozone rivers approximately 1 km thick indicates ozone movements from high altitudes to low ones. These rivers are often associated with temperature rises. A simple theory is developed which relates the eddy diffusion coefficient in the atmosphere with the vertical rate of descent at which structured ozone layers can still be seen. The diurnal variation of ozone at Minneapolis, Minnesota is measured. The transport of ozone through the atmosphere is described.

APTIC-22916

AN URBAN HEAT ISLAND MODEL.

In: Mathematical Models of Urban Air Pollution Dynamics. (Final Report). New York Univ., N. Y., Geophysical Sciences Lab., NAPCA Research Grant AP-00328-04, N. Y. U. TR-69-11, Vol. 111, 70p., Dec. 1969. 35 refs.

Douglas M. Leahey.

Identifiers: *Heat islands, *Urban areas, *Mathematical modeling, Air pollution forecasting, Ground level, Lower atmosphere, Lapse condition, Topographic interaction, Sulfur dioxide, Heat transfer, Thermodynamics.

Artificial heat sources cause the base of stable air layers, which are at ground level in rural regions, to become elevated over urban areas. An intervening layer characterized by an adiabatic lapse rate is formed. Pollutants are trapped within this layer and mixed in the vertical. A model is presented for the urban heat island which is based on the above premises and the first law of thermodynamics. It is a modified version of the advective model advanced by Summerville. The modification consists of the introduction of two heat sinks which permit an extension of the model downwind from the center of the city. Associated with the model is a method for predicting the variation of pollution within the urban heat island. The method relates the mixing ratio of a pollutant to the thickness of the adiabatic layer. Data collected from an instrumented helicopter allowed extensive testing of the model for New York City. The agreement between the observed and predicted values for the depths of the mixing layer and for sulfur dioxide mixing ratios is very encouraging. Linear correlation coefficients between the observed and predicted depths of the mixing layer and for SO₂ are .95 and .84, respectively. The model also permitted estimates to be made of heat release from the pavements, asphalt, and concrete of New York City. These estimates are the only quantitative values available for an urban complex. (Author abstract modified)

APTIC-22918

THE EFFECT OF WIND SPEED AND RAINFALL ON THE CONCENTRATION OF SULPHUR DIOXIDE IN THE ATMOSPHERE.

Intern. J. Air Water Pollution (London), vol. 6:173-177, 1962. 1 ref.

H. E. Newall, and A. Eaves.

Identifiers: *Winds, *Rain, *Sulfur dioxide, Seasonal, Great Britain, London, Urban areas, Air quality measurements, Statistical analyses.

A study is reported of the effect of wind speed and rainfall on sulfur dioxide pollution in the winter months of 1956-1960 for a number of the most heavily polluted sites in London and also for Great Britain as a whole. A value for mean daily wind speed, mean daily rainfall, and average daily SO₂ concentrations, averaged from 84 sites, is given for each of the four winter periods studied. Analysis showed that the average daily SO₂ concentration is considerably affected by wind speed in inverse relationship, but that there are also other important causes of variation. It was not apparently related to rainfall.

APTIC-22919

POSSIBILITIES FOR DETERMINING EXPERIMENTALLY THE SPECTRA OF TRUE ABSORPTION FOR CLOUDS AND FOGS.

IN: Investigation of Clouds, Precipitation, and Thunderstorm Electricity. (Issledovaniya oblakov, osadkov i gromovogo elektrichestva). Moscow, Izd-vo Akademii Nauk SSSR, 1961, p. 58-64, 22 refs. (Presented at the International Symposium on Radiation, Oxford, July 1959.) Translated from Russian by D. Grandjean, Foreign Technology Div., Wright-Patterson AFB, Ohio, Translation Div., 11p., Feb. 23, 1968. CFSTI, DDC: AD 682774

G. V. Rozenberg.

Identifiers: *Absorption, *Clouds, *Light radiation, USSR, Dispersion, Fog.

Radiational processes in clouds and fogs are considered in the study of the volumetric factors of absorption and dispersion and their spectral relationships. Everything discussed relates to that region of the spectrum where self-radiation of the dispersive substance or gaseous phase does not play a part. Reliable methods of experimentally determining the true spectra of absorption and

dispersion in clouds and fogs are possible; they are by no means trivial, and their development requires special attention.

APTIC-22921

PARTICLE DEPOSITION FROM TURBULENT AIR FLOW.

IN: Pacific Northwest Laboratory Annual Report for 1969 to the USAEC Division of Biology and Medicine. Volume II: Physical Sciences. Part I. Atmospheric Sciences. Battelle Northwest, Richland, Wash., Environmental and Life Sciences Div., p. 126-129, June 1970. 1 ref. CFSTI: BNWL-1307, Part I

G. A. Sehmel, and L. C. Schramm.

Identifiers: *Turbulence (atmospheric), *Deposition, *Particulates, Ground level, Diffusion models, Fluid flow.

A theoretical model is developed to describe the turbulent deposition of particles through the boundary layer adjacent to a deposition surface. The particle eddy diffusivities are back-calculated from the deposition data. From these calculations it is concluded that particle turbulent diffusivities are greater than those for air momentum transfer in turbulent flow. (Author abstract modified)

APTIC-22924

LEAD AND LEAD-210 IN RAINWATER.

Nature, vol. 216:353-355, Oct. 28, 1967. 16 refs.

Haarlem, G. L., and R. B. Holtzman.

Identifiers: *Precipitation, *Lead compounds, *Isotopes, *Radioactive tracers, Non-urban areas, Soils, Aerosols, Rain, Thunderstorms, Inversion.

Knowing the mean residence time of the lead aerosol in the atmosphere is important, because for any given set of meteorological conditions and fixed rate of injection, the atmospheric concentration will be an inverse function of the residence time. Lead-210 has a half-life of 21.4 yr and would be an ideal tracer for stable lead if lead and lead-210 were acted on by the same forces. To evaluate their relationship in the atmosphere, samples of rainwater were collected, filtered, and analyzed by a spectrophotometric dithionite method. The rainwater was collected in a semi-rural area 25 miles west of Chicago and in an area of farms 125 miles north-east of the Argonne site. Lead-210 was determined from the beta count rate of its bismuth-210 daughter. Concentrations of the stable lead and lead-210 and the amount and type of rainfall in the various samples of rainwater from the two sites are presented tabularly. A shower had lower concentrations than a slow, even rainfall; thundershowers usually had lower concentrations, but they could also be very high. One rainfall with high values was preceded by a thermal inversion for the 7 days prior to precipitation, that the preceding weather may affect lead concentrations. A brief study near Argonne showed that the soil contained about 20 micrograms of lead and 1.5% of lead-210 per g of dry material. From these data and from the correlation between lead and lead-210 established in this study, a mean residence time for stable lead of about 1 month is indicated. It appears that the radioactive isotope is an adequate tracer for estimate of the residence time of stable lead only in rainwater or perhaps in air from higher altitudes, not above the ground.

APTIC-22959

ELECTRIC SPACE-CHARGE PULSES NEAR THE GROUND IN SUNNY WEATHER.

J. Atmospheric Terrest. Phys., vol. 32:1131-1138, 1970. 11 refs.

T. L. Ogden, and W. C. A. Hutchinson.

Identifiers: *Plume behavior, *Convection (atmospheric), Great Britain, Electric charge, Ground level, Electric charge.

Measurements are presented of abrupt pulses of electric space-charge density in sunny weather. The pulses, of amplitude about 50 pC m⁻¹ to the minus third power, are not confined to one site,

and circumstantial evidence suggest that they occur only when free convection is possible. They are not identical with convective plumes, however. This is clear mainly from their horizontal separation and the size of the space-charge fluctuations, which is an order of magnitude larger than that expected on the basis of Priestley's plume theory. Their origin remains obscure. In applying Priestley's theory to space charge, it is shown, incidentally, that existing measurements of space-charge density in fine weather are consistent with a maximum convection of 1 m of about half the magnitude of the conduction current. (Author abstract)
APTIC-22985

THERMAL EFFECT OF HYGROSCOPIC SMOKE.

(Teplovoy efekt gigroskopicheskikh dymov). Text in Russian. Tr. Ukr. Nauch. Issled. Gidrometeorol. Inst., no. 65:192-200, 1967. 5 refs. I. I. Bochkovskaya, Yu. I. Novikov, A. I. Sidorov, and L. G. Stochilo.
Identifiers: *Smokes, *Temperature (atmospheric), *Hygroscopicity, Ussr, Farms, Ground level, Humidity, Weather modification.

The thermal effect of new hygroscopic smokes (types P-4 and A-5, used in agricultural frost control) on the radiation and thermal regime of underlying surface air layers was studied experimentally on 1000 by 700 m plots. Surface thermal effect 100 m from the smudge pots was approximately 1.0 degree C, dropping to 0.5 degree at 300 m. Thermal effect in the air was nearly constant to a height of 2 m and averaged 0.7-1.0 degree (1.2 degree maximum with type A-5 smoke). Thermal effect rose sharply during the first half hour, then continued to rise very gradually. Relative humidity dropped 4-5% during the first 5 minutes. This drop accounts for a 0.8 degree thermal effect and hence is a dominant factor in frost control by this method.
APTIC-23017

CLIMATIC EFFECTS OF ATMOSPHERIC POLLUTION.

Preprint, American Association for the Advancement of Science, Washington, D. C., 14p., 1968. 21 refs. (Presented at the American Association for the Advancement of Science National Meeting, Dallas, Tex., 1968.) Reid A. Bryson, and Wayne M. Wendland.
Identifiers: *Weather modification, *Carbon dioxide, *Dusts, Winds, Temperature (atmospheric).

The trend of world temperature in this century appears to be related directly to the trends of atmospheric carbon dioxide content and atmospheric turbidity (dustiness). Both are believed by various scholars to be related to human activities. Since 1940, the effect of the rapid rise of atmospheric turbidity appears to have exceeded the effect of rising carbon dioxide, resulting in a rapid downward trend of temperature. There is another effect of increased turbidity that is more important locally than the mean world temperature change; it is the effect on the meridional radiation gradient and thus on the thermal Rossby number and the circulation pattern. Increased turbidity should reduce the meridional radiation gradient and, therefore, weaken the westerlies. This change of gradient can have profound climatic effects. Because industrial revolution is still underway in large parts of the world, it appears that there is little any one nation can do to reverse the increases in carbon dioxide and atmospheric turbidity. Nevertheless, the problem should be studied much more extensively than in the past. (Author abstract modified)
APTIC-23033

IDENTIFICATION OF METEOROLOGICAL OBJECTS FROM REFLECTED LASER SIGNALS.

Tr. Tsentr. Aerolog. Observ. (Moscow), no. 84:94-100, 1969. 3 refs. Translated from Russian. Joint

Publications Research Service Washington, D. C., 9p., March 27, 1970. CFSTI: JPRS 50172
A. Ye. Tyasbotov, V. I. Shlyakhov, and A. B. Shupyskiy.
Identifiers: *Lasers, *Clouds, *Fog.

Studies were carried out on the possibilities of determining the phase of clouds and fogs based on the polarization characteristics of a laser beam, determining the attenuation factor of these objects based on the widening of the reflected laser signal, and establishing the signal's depolarization depending on the beam's angle of incidence. Measurements were conducted from earth and from an aircraft during 1966-1967. The device used was a pulse-type ruby laser whose signals were reflected to four telescopes and then through a photoelectric multiplier to an oscillograph. All signals reaching the screen of the oscillograph were photographed. Data obtained on widening of signals at reflection from clouds and the degree of polarization of signals reflected from clouds and fog are tabulated. The tables indicate that these factors can be used to obtain fairly extensive information about the condition of meteorological objects. Specifically, based on the pulse's widening, it is possible to determine the attenuation factor of clouds and fogs. The polarization characteristics of the reflected signals permit the detection of all types of clouds and fogs.
APTIC-23034

ATMOSPHERIC DIFFUSION OF HEAVY IMPURITIES EMITTED FROM A POINT SOURCE.

(Rasprostraneniye v atmosfere tyazheloy primesi, vydelyayemoy tochechnym istochnikom). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana, 1 (9):920-928, 1965. 7 refs.
Ya. S. Rabinovich.
Identifiers: *Diffusion models, *Point sources, Ussr, Stack gases, Settling particles, Mathematical analyses, Winds, Inversion, Turbulence (atmospheric).

Mathematical analysis of scattering of heavy impurities in a turbulent atmosphere is presented. Vertical wind profiles and vertical diffusion coefficients are approximated by power functions of height. Maximum concentration of heavy impurities occurs closer to the source, relative to the range of maximum concentration of a weightless gas, the greater the source height. A critical distance below which heavy impurity concentration is greater than that of a gas, and beyond which the gas concentration is higher, is demonstrated; this distance decreases with increased source height. The distance of this critical point also varies with the condition of atmospheric stratification, and is minimum with unstable stratification, maximum in the case of an inversion.
APTIC-23035

THERMODYNAMIC CONSIDERATIONS IN THE INTERACTIONS OF NITROGEN OXIDES AND OXY-ACIDS IN THE ATMOSPHERE.

J. Air Pollution Control Assoc., 6 (2):97-100, 1956. 15 refs. (Presented at the Air Pollution Control Association, 49th Annual Meeting, Buffalo, N. Y., May 20-24, 1956.) Aubrey P. Altshuler.
Identifiers: *Nitrogen oxides, *Photochemical reactions, *Thermodynamics, Urban areas, Nitric acid, Nitric oxide (no), Nitrogen dioxide (no2).

Equilibrium constants, calculated from recent spectroscopic and structural measurements, are reported for some nitrogen dioxide reactions. From these constants, estimated concentrations of gaseous nitrogen oxides and oxy-acids in urban atmospheres were calculated. It is emphasized that the equilibrium conditions to which the data apply may be reached very slowly or rapidly, or at some intermediate rate. Determination of this rate is a problem for experimental kinetics rather than thermodynamics. The value of thermodynamic information is that it can tell whether a small or large amount of a given reactant will exist at equilibri-

um. The present thermodynamic study indicates that among the nitrogen oxides and oxy-acids, nitric oxide, nitrogen dioxide, and nitric acid are probably the most prevalent in polluted urban air. Nitrous oxide is also present in urban air but is of less importance because of its lower chemical reactivity.
APTIC-23037

ON THE PROPAGATION OF SMOKE FROM FACTORY STACKS.

(O rasprostraneni dyma iz fabrichnykh trub). Tr. Gl. Geofiz. Observ. (Leningrad), no. 77:84-94, 1958. 14 refs. Translated from Russian by Irene A. Donebo, Weather Bureau, Washington, D. C., Foreign Area Section, 15p., Jan. 1961. L. S. Gandin, and R. E. Soloveichik.
Identifiers: *Smokes, *Mathematical analyses, *Plume behavior, Ussr, Particulates, Stacks, Particle size, Diffusion, Transport, Winds, Flow rates.

A theoretical analysis of smoke propagation from factory stacks is performed to establish the relationships among the strength of the source (amount of smoke per unit time), rate of fall of particles, concentration of admixture, and wind speed. Both the wind speed and the horizontal exchange coefficient are considered to increase with height in an approximation of true atmospheric conditions. The effect of superheating of the effluent particles is insignificant within the framework of the analysis and is disregarded. Maximum concentration was independent of either wind speed or the horizontal diffusion coefficient; rather, it is wholly a function of time. In the discussion of the effects of the particle, the aerosol is assumed to be polydisperse, but the size of each particle is assumed to be constant. An increase in the source strength increases the concentration only to a limit, following which additional increases result in a decrease in concentration.
APTIC-23039

SPECTRAL METHOD OF ESTIMATING THE TEMPERATURE OF ATMOSPHERIC OZONE.

(O spektral'nom metode otsenki temperatury atmosfernogo ozona). Text in Russian. Geomagnetizm i Aeronomiya, 8 (1):93-101, 1968. 25 refs.

R. S. Steblova.
Identifiers: *Ultraviolet spectrometry, *Temperature (atmospheric), *Ozone, Diurnal, Seasonal, Ussr, Altitude, Upper atmosphere, Temperature gradient, Turbulence (atmospheric), Dissociation, Photochemical reactions, Solar radiation.

Problems of ground-based determination of the temperature of atmospheric ozone by the spectral method are examined by comparing laboratory and field data taken from the literature. Only an effective temperature of the ozonosphere may be established by this method, and this temperature cannot be ascribed to a definite altitude because of a number of other variables: vertical distribution of kinetic temperature, ozone concentration, number of acts of photodissociation, as well as height distributions of photochemical processes, anomalous quantum-level distributions, and Auger effect. The height of the sun affects the diurnal and seasonal courses of effective temperature values. Measurements of this effective temperature are useful in detecting perturbations of the normal state of the ozonosphere, the nature of change in effective temperature giving an indication of the height at which these perturbations take place.
APTIC-23042

SOME OBSERVATIONS OF BENT PLUMES.

Roy. Meteorol. Soc. Quart. J., vol. 84:61-65, 1958. 5 refs.

F. K. Ball.
Identifiers: *Oil burners, *Smokes, *Plume behavior, Australia, Mathematical analyses, Winds.

From July 1955 to January 1956, observations were made of the height of the center line of smoke plumes rising from four oil burners situated close together on the ground. The burners were of the lard-pail type used for orchard heating. Plume heights were estimated at 30 ft and 60 ft downwind by comparison with a number of vertical 10-ft poles placed on arcs at these distances from the burners. The results are summarized in tabular form and compared with Priestley and Sutton's theories of plume behavior. When wind speed exceeded about 12 ft reciprocal sec, buoyancy no longer dominated the motion of the plume. A general nondimensional solution of Sutton's equation is developed which can be applied to bent plumes on any scale.

APTIC-23045

A WORKING THEORY OF THE BENT-OVER PLUME OF HOT GAS.

Roy. Meteorol. Soc. Quart. J., vol. 82:165-176, 1956, 8 refs.

C. H. B. Priestley.

Identifiers: *Plume behavior, Australia, Stacks, Diffusion, Winds, Turbulence (atmospheric).

An ascending plume of hot gas is initially diffused by the turbulence induced by its own motion, and later by the natural turbulence of the environment, but before all upward motion and buoyancy are lost. A working solution is presented for the first phase in terms of a spreading coefficient (c) and for the second in terms of a mixing rate (k); it is shown that the transition from one phase to the other should be quite well marked. Proposed laws for c and k as functions of wind speed lead to good agreement with Bosanquet's measurement of plume heights downwind from factory chimneys. The theory extends to conditions of thermal stratification. It shows that a final equilibrium level should always exist, except when very light winds coincide with unstable stratification. In addition, the theory indicates the buoyancy and stratification factors appropriate for scaling down to wind-tunnel experiments. The relative roles of initial impetus and initial buoyancy are characterized by a modified form of the Froude number. (Author abstract modified)

APTIC-23052

MEASUREMENTS OF AIR TURBULENCE IN READING AND THEIR RELATION TO TURNER'S STABILITY CATEGORIES.

Phil. Trans. Roy. Soc. London, Ser. A, 265 (1161):191-195, Nov. 13, 1969, 10 refs.

K. J. Marsh, and S. L. Hobkinson.

Identifiers: *Reading, *Stability (atmospheric), *Turbulence (atmospheric), Great Britain, Urban areas, Stack gases, Stacks, Continuous monitoring, Diffusion, Plume behavior.

Continuous air turbulence measurements were made near the center of Reading, England, for a one-year period. These were intended to provide data for deriving diffusion parameters for calculating the dispersion of pollution from chimneys in the town. They were obtained by using a binnacle mounted on a 14-m mast; the intensities of lateral and vertical turbulence for 1-hr periods were derived by means of electronic analyzers. Similar measurements were made for a period of about four weeks on the roof of the British Petroleum Co. Research Centre, Sunbury-on-Thames. The values of intensity of turbulence were grouped according to Turner's stability categories and the averages within the groups were compared by variance analysis. This showed significant differences in turbulence between the unstable categories and the neutral categories, but the stable categories were not distinguished from neutral. The addition of a filter to cut out the high frequency band of the fluctuations showed that a considerable portion of the measured turbulence had been in this band. This is attributed to mechanical turbulence produced by surrounding buildings. Eliminating the high frequency band also distinguishes the stable categories from neutral. The measurements of intensity of turbulence have

been used to estimate the spread of plumes in the town. The lateral spread is greater than that reported by other investigators, but the vertical spread is similar. (Author abstract modified)

APTIC-23053

COMMUNICATIONS ON DUST DEPOSITION FROM CHIMNEY STACKS.

Proc. Inst. Mech. Engrs. (London), vol. 162:366, 1950.

J. Halitaky, C. P. Randell, and M. Hackman.

Identifiers: *Deposition, *Dusts, *Plume behavior, Stack gases, Smokes, Stacks, Mathematical analyses, Photographic methods, Simulation, Testing facilities.

In recent wind-tunnel tests, oil-fog smoke was emitted from stacks in a tunnel three and one-half feet high times seven feet wide times thirty feet long. The trails were photographed under controlled conditions of gas velocity and wind velocity. The trails were satisfactorily described by existing formulae. However, when the estimated center of each photographed trail was compared with the calculated center line, the estimated trail could not be determined precisely. This was especially true for tests where large diameters and small values of gas velocity/wind velocity were combined. It appears that a large stack disturbs the flow more than would be expected from a non-dimensional equation. The disturbance results in a poorly defined lower edge of the trail, making for a questionable estimate of the center. Nevertheless, it is still possible to describe numerically the fit between actual and theoretical trails, provided the above limitation is kept in mind.

APTIC-23057

PHORETIC AND BROWNIAN DIFFUSION PROCESSES IN THE IN-CLOUD SCAVENGING OF AEROSOL PARTICLES.

In: Pacific Northwest Laboratory Annual Report for 1969 to the USAEC Division of Biology and Medicine. Volume II: Physical Sciences. Part I.

Atmospheric Science, Battelle Northwest, Richland, Wash., Environmental and Life Sciences Div., p. 92-96, June 1970, 15 refs. CFSTI: BNWL-1307, Part I

W. G. N. Slinn, and J. M. Hales.

Identifiers: *Diffusion, *Clouds, *Scavenging, *Aerosols, Droplets, Particle size, Convection (atmospheric), Temperature (atmospheric), Brownian movement, Nucleation, Water, Ice.

An analysis is made of the relative importance of thermophoresis, Brownian diffusion and diffusio-phoresis, for the in-cloud scavenging of aerosol particles, accompanying the condensation and Bergeron-Findeisen process. Under the assumption that all of the latent heat associated with vaporization (condensation) is conducted to (from) the precipitation embryo, it is shown that thermophoresis is of dominant importance for particles of radii between 0.01 to 1.0 micron. The steady-state solution to the appropriate convective-diffusion equation is presented. Thermophoresis could be a significant mechanism for the in-cloud contact ice nucleation of water droplets in a subfreezing cloud. (Author abstract modified)

APTIC-23068

FREQUENCY OF 'CALM' DAYS IN ISRAEL.

Ministry of Transport and Communications (Israel), Meteorological Service, Series C (Miscellaneous Papers), Rept. 22, 8p., 1968, 12 refs.

D. Elbasha.

Identifiers: *Winds, *Rain, *Israel, Annual, Monthly, Seasonal, Asia, Statistical analyses.

The geographic distribution of annual and monthly frequencies of calm and rainless days within the area of Israel is presented. Calm is defined as a day with no rain and winds less than 7 kts. Statistical analyses of the data are included. The network

of reporting stations is described, together with experimental measurements. Variance analyses indicate that no significant regions of similarity exist. Longer durations of consecutive calm days usually occur during the fall-winter season. The hazard of air pollution is meteorologically more pronounced during the first half of the rainy season.

APTIC-23075

DIFFUSION OF AN IMPURITY FROM A POINT SOURCE IN THE GROUND LAYER OF THE ATMOSPHERE.

(O diffuzii primesi ot tochechnogo istochnika v prizemnom sloye atmosfery). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana, 2 (6):576-584, 1966, 12 refs.

D. L. Yordanov.

Identifiers: *Diffusion models, *Point sources, USSR, Mathematical analyses, Ground level, Lower atmosphere.

Diffusion of an impurity from a point source in the ground layer of the atmosphere is analyzed; horizontal diffusion in the direction of the wind is treated statistically, while vertical diffusion is treated on the basis of a semi-empirical formula. Vertical diffusion in the presence of unstable stratification is treated as a two-layer problem. Theoretical results are in qualitative agreement with experimental data.

APTIC-23076

ANISOTROPIC BROWNIAN DIFFUSION IN FREE-MOLECULE COUETTE FLOW.

In: Pacific Northwest Laboratory Annual Report for 1969 to the USAEC Division of Biology and Medicine. Volume II: Physical Sciences. Part I.

Atmospheric Sciences, Battelle Northwest, Richland, Wash., Environmental and Life Sciences Div., p. 111-114, June 1970, 9 refs.

CFSTI: BNWL-1307, Part I

W. G. N. Slinn.

Identifiers: *Diffusion, *Brownian movement, *Aerosols, *Couette flow, Mathematical analyses, Flow rates.

Results are given for the theory of Brownian motion of large Knudsen number aerosol particles, hosted by linearized, free-molecule Couette flow. The tensorial diffusion coefficient displays the dependence of diffusion on the viscous stress within the gas. To predict that anisotropy is a universal feature of Brownian diffusion in a nonequilibrium environment; however, much work remains to be done, especially for small Knudsen number particles and for the case when the host fluid is a liquid. (Author abstract modified)

APTIC-23081

EXPERIMENTAL DATA ON RAGWEED POLLEN DISPERSION AND DEPOSITION FROM POINT AND AREA SOURCES.

Brookhaven National Lab., Upton, N. Y., NAPCA Grant AP-81, 33p., Feb. 1970, 11 refs.

CFSTI: BNWL 50224 (T-564)

Gilbert S. Raynor, Janet V. Hayes, and Eugene C. Ogden.

Identifiers: *Deposition, *Pollens, *Diffusion, Line sources, Plume behavior, Point sources, Winds.

Dispersion and deposition of ragweed (Ambrosia) pollen released naturally from circular area sources of cultivated plants and artificially from point sources were measured in a series of experiments. Concentrations were measured by wind-impaction samplers on 20 degree radii at four heights and at four or five distances from the sources. Deposition was measured from greased microscope slides on the ground. Field, laboratory, and analysis procedures are described, and original and derived data are presented. Dispersion data include centerline and crosswind integrated concentrations, plume widths and heights, and mass flux at each sampling distance. Deposition

data include centerline and crosswind integrated deposition, magnitude of deposition, and deposition velocity. Also presented is a comparison between deposition and loss in mass flux. (Author abstract modified)
APTIC-23022

MICROMETEOROLOGICAL DIFFUSION FORMULAE: A QUANTITATIVE ASSESSMENT OF THEIR RELATIVE MERITS IN THE LIGHT OF AVAILABLE DATA.

Chemical Defence Experimental Establishment, Porton (England), TP-329, 43p., March 26, 1953. 14 refs.

D. J. Holland.

Identifiers: *Diffusion models, *Micrometeorology, Great Britain, Line sources, Point sources, Winds.

Various formulae, due to Sutton, Calder and Deacon, for the time-mean results of diffusion from line and point sources are mathematically related, and the underlying assumptions are stated. After a review of the physical parameters involved, the formulae are evaluated over the ranges of value likely to be met in practice. A discussion of the best experimental ways of determining the values of the parameters appearing in the wind profile brings out the inconsistency of the results. Calculations from the formulae are compared with the available experimental results. Sutton formulae (empirically extended to cover non-adiabatic conditions) and the Calder-Deacon formulae are comparable in accuracy. The agreement between observed and calculated quantities is within a factor of 2 on more than 80% of occasions of approximately adiabatic conditions and on more than 40% of other occasions. The calculated values of C.L.D. are more often over-estimates than under-estimates. The lateral-vertical gustiness ratio whose use in the formulae best fits the facts is 3 to the nearest integer. (Author abstract modified)
APTIC-23045

METEOROLOGICAL PHENOMENA THAT INFLUENCE DIFFUSION CALCULATIONS.

(Meteorologische Einflussgrößen in der Ausbreitungsrechnung). Text in German. Staub (Duesseldorf), 24 (10):396-400, Oct. 1964. 7 refs. Werner Klag.

Identifiers: *Mathematical analyses, *Diffusion, *Meteorology, Germany, Idaho, Massachusetts, Nebraska, Washington (state), Winds, Clouds, Stability (atmospheric), Turbulence (atmospheric), Solar radiation.

Data on meteorological parameters, obtained from the evaluation of results in a group of original diffusion experiments, are presented as material useful in the calculation of diffusion. Results were obtained by a comparison of diffusion experiments conducted at various geographical locations in the United States; the Prairie Grass Project (Nebraska, summer 1956), the Round Hill Studies (Massachusetts Institute of Technology, 1954, 1955, 1957), G. E. Tests (Washington State), and the Idaho Falls Study (National Reactor Testing Station, U. S. Weather Bureau). The mathematical processes by which the meteorological parameters were calculated are discussed in detail. The first two source studies provided data on such meteorological phenomena as wind velocity, solar radiation during daylight hours, and cloud cover at night. The G. E. Study did not include meteorological data. The figures obtained from all 4 studies were compared on the basis of atmospheric stability, which was rated in 6 categories (A-F) ranging from extremely unstable to highly stable. Values of the parameter in these categories are given in tabular form.
APTIC-23093

MICROPARTICLE DEPOSITION ON POLAR ICE SHEETS.

Ohio State Univ., Columbus, Inst. of Polar Studies, NSF Grant GA 530, Rept. 29, RF 2262, 77p., May 1969. 30 refs. CFSTI: PB 186468

Wayne L. Hamilton.

Identifiers: *Polar ice sheets, *Deposition, *Dusts, Particle size, Precipitation, Snow, Temperature (atmospheric), Nucleation, Ice, Seasonal.

Much of the variation in the kinds, concentration, and size distribution of microparticles (larger than 0.6 micron diameter) in snow accumulation on the Antarctic and Greenland ice sheets is the result of seasonal and regional differences in temperature and precipitation rate. Microparticle deposition on polar ice sheets is almost entirely accomplished through the process of precipitation. The effects of temperature on nucleation and of atmospheric dust concentration (controlled by precipitation rate) on scavenging lead to seasonal patterns of microparticle deposition. The population of particles at any given time is composed of 'background' and 'critical' groups. The effect of mean annual temperature on mean sublimation nucleus size is reflected in the size distribution of particles from different sites at different elevations. The relationship between temperature and size distribution is used in interpreting particle distributions in deep ice samples. (Author abstract modified)
APTIC-23095

PERTURBATION SOLUTION OF AN EQUATION OF ATMOSPHERIC TURBULENT DIFFUSION.

J. Geophys. Res., 75 (27):5173-5178, Sept. 20, 1970. 6 refs.

Gour-Tsyh Yeh, and Wilfried Brutsaert.

Identifiers: *Mathematical analyses, *Diffusion, *Turbulence (atmospheric).

The regular perturbation method with a small parameter is applied to solve a turbulent transfer equation in the lower atmosphere without the lateral effect. From this solution, the effect of longitudinal diffusion on evaporation is shown to be negligible up to the first order for evaporating surfaces greater than, say, 100 cm. (Author abstract modified)
APTIC-23105

PLUME OPACITY AND PARTICULATE MASS CONCENTRATION.

Atmos. Environ., 4 (2):163-173, 1970. 18 refs.

Michael J. Pilat, and David S. Essor.

Identifiers: *Plume behavior, *Statistical analyses, *Particulates, *Turbidimetry, Ringelmann chart, Visibility, Particle size, Refractive index.

A general theoretical relationship between plume opacity and the properties of particulate air pollution is developed. The results are in agreement with previously reported theoretical equations for specific emissions and with known measurements of plume opacity and particle properties. A parameter, K , defined as the specific particulate volume/light extinction coefficient ratio is used to relate the plume opacity to the particle properties. Graphs of K vs. the particle geometric mass mean radius at geometric standard deviations of 1, 1.5, 2, 3, 4, and 5 are presented for particles of refractive index 1.33 (water) and 1.95-0.66i (carbon). An example is included illustrating the use of the theoretical results to calculate the maximum allowable particle concentration which will meet a given Ringelmann number. (Author abstract)
APTIC-23111

TRANSFER PROPERTIES ON THE LARGE-SCALE EDDIES AND THE GENERAL CIRCULATION OF THE ATMOSPHERE.

Quart. J. Roy. Meteorol. Soc. (London), 96 (408):157-185, April 1970. 26 refs.

J. S. A. Green.

Identifiers: *Atmospheric movements, *Diffusion models, Great Britain, Altitude, Diffusion, Transport, Cyclones (atmospheric), Winds, Heat transfer, Thermodynamics.

The transfer of heat and momentum by motion on the scale of cyclone waves and long waves is deduced from a knowledge of their mechanics. The law of horizontal transfer of entropy is independent of notions of mixing but is similar to that for nonisotropic diffusion. The law accurately represents the annual variation of heat flux in the Northern Hemisphere. Perturbation theory suggests realistic spatial variations for the transfer and provides a rational basis for calculating transfer coefficients which can then be used to find the flux of other conservative quantities. The Equatorward flux of potential vorticity is well defined and is shown to determine the horizontal flux of momentum. The mean surface winds, and the mean meridional circulation (which is frictionally driven), are then determined. A model of the general circulation is defined by these properties. It is analytically integrated for a simplified case and compared with motion observed in the Gulf Stream, the mesosphere, and diurnal experiments as well as the troposphere. (Author abstract modified)
APTIC-23113

ATMOSPHERIC VORTICITY AND DUST DEVIL ROTATION.

J. Geophys. Res., 75 (27):5179-5184, Sept. 20, 1970. 10 refs.

J. J. Carroll, and J. A. Ryan.

Identifiers: *Dusts, *Atmospheric movements, *Vorticity, Convection (atmospheric), Stability (atmospheric).

Some results are presented from a field experimental program the purpose of which was to determine, as quantitatively as possible, dust devil dynamics. Direction of rotational data were obtained by stationing a number of observers over a prescribed area, which allowed close-in observation of the dust devils, while a concurrent measure of atmospheric vorticity was obtained by a specially constructed 'vorticity' meter. In general, there was almost no preference in direction of dust devil rotation but often, over short periods, one rotation direction would be strongly favored. A definite correlation existed between the sense of atmospheric vorticity and the direction of dust devil rotation. The earth's rotation, mesoscale phenomena, and shed eddies are indicated to play little, if any, role in determining the direction of rotation. The source of the required vorticity appears to be produced primarily, if not entirely, by local processes. Shear in the horizontal flows associated with convective activity in an unstable atmosphere is suggested to be the responsible process. (Author abstract modified)
APTIC-23119

THE USES AND LIMITATIONS OF TREND SURFACE ANALYSIS IN STUDIES OF URBAN AIR POLLUTION.

For primary bibliographic entry see Field 02.

APTIC-23131

A COMPARATIVE SURVEY OF ATMOSPHERIC POLLEN AND FUNGUS SPORES AT TWO PLACES TWENTY MILES APART.

For primary bibliographic entry see Field 04.

APTIC-23154

LECTURE ON PUBLIC NUISANCE. PART III. SO₂ GAS POLLUTION CONTROL. I.

For primary bibliographic entry see Field 11.

APTIC-23163

WILL THE SST POLLUTE THE STRATOSPHERE?

For primary bibliographic entry see Field 01.

APTIC-23166

AN INTERPRETATION OF THE IN-CLOUD SCAVENGING OF PARTICULATES.

In: Pacific Northwest Laboratory Annual Report for 1969 to the USAEC Division of Biology and Medicine. Volume II: Physical Sciences. Part I. Atmospheric Sciences. Battelle Northwest, Richland, Wash., Environmental and Life Sciences Div., p. 107-110, June 1970. 4 refs. CFSTI: BNWL-1307, Part I

W. E. Davis.
Identifiers: *Scavenging, *Deposition, *Clouds, Aerosols, Mathematical analyses, Rain, Chlorine compounds, Sodium compounds, Isotopes, Radioactive tracers.

Results are presented of a comparison of computed rates of deposition, arrived at by assuming an in-cloud scavenging coefficient, with rates of deposition computed from observations of cosmogenic radionuclides in rain-water. In-cloud scavenging coefficients of 0.0001 to 0.001 reciprocal sec would agree with the deposition rates calculated from observations for sodium-24. However, the same coefficients would not predict the rates of deposition calculated from observations of chlorine-38. Since these results can be dramatically altered by assuming different liquid water contents of the cloud and cloud thickness, it is recommended that cloud water content be measured as well as cloud depth. (Author abstract modified)

APTIC-23171

COSMOGENIC RADIONUCLIDE TRACERS OF IN-CLOUD SCAVENGING PROCESSES.

In: Pacific Northwest Laboratory Annual Report for 1969 to the USAEC Division of Biology and Medicine. Volume II: Physical Sciences. Part I. Atmospheric Sciences. Battelle Northwest, Richland, Wash., Environmental and Life Sciences Div., p. 105-106, June 1970. 3 refs. CFSTI: BNWL-1307, Part I

R. W. Perkins, C. W. Thomas, J. A. Young, and H. G. Rieck Jr.
Identifiers: *Clouds, *Rain, *Scavenging, Chlorine compounds, Sodium compounds, Radioactive tracers.

Rainwater development was observed during three rainstorms in Washington with cosmogenic radionuclide tracers. This technique involves collection of sodium-24 on cation and chlorine-38 and chlorine-39 on anion resin beds, followed by direct counting on multi-dimensional gamma-ray spectrometers. During their in-cloud development, the raindrops may be subjected to several cycles of partial evaporation followed by further coalescence and condensation, particularly in light rains. Light rains are indicated to have spent a substantially longer period in their development than heavy rains. The time period for raindrop development ranged from approximately 30-130 min in the light to medium rains. Rainout coefficients were in the range of 0.001 to 0.01 reciprocal sec but could be some two- to three-fold lower, depending on the effective altitude of the cloud top. The apparent time since previous rainout in the rainstorms ranged from 30-200 min from estimates of the Na-24:Cl-38 ratio.

APTIC-23172

MEASUREMENTS OF THE TRANSPORT SPEED AND PHYSICAL DIMENSIONS OF A DIFFUSING PUFF OF A GASEOUS TRACER IN THE ATMOSPHERE.

In: Pacific Northwest Laboratory Annual Report for 1969 to the USAEC Division of Biology and Medicine. Volume II: Physical Sciences. Part I. Atmospheric Sciences. Battelle Northwest, Richland, Wash., Environmental and Life Sciences Div., p. 10-14, June 1970. 1 ref. CFSTI: BNWL-1307, Part I

P. W. Nickola.
Identifiers: *Plume behavior, *Transport, Tracers, Winds, Stability (atmospheric), Turbulence (atmospheric), Radioactive tracers.

Measurements of puff dimensions and transport speed were obtained from five inert gas tracer releases. The speed of transport increased with distance from the source, and the speed (in all but one case) corresponded to wind speeds measured at heights between tracer releases and sampling heights. Puff dimensions were greater in the downwind direction (length) than in the crosswind direction (width) in all cases. In unstable atmospheres, the ratio of puff length to puff width decreased as the puff moved from 200-800 m from the source. However, in more stable atmospheres, the ratio of puff length to width increased during the 200-800 m transport period. (Author abstract)

APTIC-23180

SHORT PERIOD ATMOSPHERIC CONCENTRATIONS RESULTING FROM NEAR GROUND LEVEL TRACER RELEASES OVER ROUGH TERRAIN.

In: Pacific Northwest Laboratory Annual Report for 1969 to the USAEC Division of Biology and Medicine. Volume II: Physical Sciences. Part I. Atmospheric Sciences. Battelle Northwest, Richland, Wash., Environmental and Life Sciences Div., p. 15-18, June 1970. 2 refs. CFSTI: BNWL-1307, Part I

P. W. Nickola.
Identifiers: *Plume behavior, *Tracers, Mountains, Ground level, Diffusion, Topographic interactions.

Real-time measurements were made of atmospheric concentrations of a tracer released over a marine terrace in southern California. The tracer was released continuously over periods of 30 min. The maximum short period (5 sec) concentration observed near plume centerline was as much as 14 times the value of the 30-min mean concentration observed at the plume centerline. The maximum short-period-to-mean-center-line concentration ratio decreased with increasing distance from the centerline. Distributions of short period concentrations contributing to mean concentration are given for several different locations within a diffusing plume. (Author abstract)

APTIC-23181

MODIFICATION OF AEROSOL SIZE DISTRIBUTION IN THE ATMOSPHERE AND DEVELOPMENT OF AN ION COUNTER OF HIGH SENSITIVITY. (FINAL TECHNICAL REPORT).

Johannes Gutenberg-Universität, Mainz, Germany. Meteorologisch-Geophysikalisches Inst., Contract Da 91-591-EUC-3484, 82p., Aug. 1965. 23 refs. CFSTI, DDC: AD 669376

Christian Junge and Nikolaus Abel.
Identifiers: *Particle size, *Lower atmosphere, *Clouds, Germany, Aerosols, Particle counters, Design criteria, Mathematical analyses, Ions, Radioactive tracers.

In a study of the change in size distribution of tropospheric aerosols in an atmosphere filled with clouds, earlier equations for estimating the range of several basic parameters of cloud physics are reviewed and modified. Comprehensive calculations of the change with time of various initial size distributions are presented. Pronounced modifications of the size distributions of tropospheric aerosols are unlikely to occur for particle sizes larger than 0.1 to 0.2 micron during time intervals up to a week. In particular, size distributions in this range, whatever they may be, can not represent coagulation, or coagulation-sedimentation equilibria. An attempt was made to calculate equilibrium size distributions of tropospheric aerosols. A comparison of these results with information available on tropospheric background aerosols is encouraging and makes it possible to narrow somewhat the range of some of the basic cloud physics parameters introduced and used in this study. Equilibrium aerosol distributions are discussed at length. A preliminary study was made of the effect of modifications of atmospheric aerosols such as aging on their chemical composition

and the effect of the aerosol source. The modifications can be related to certain meteorological situations and may provide a means of checking theoretical concepts. The composition of the aerosol can be characterized by trace elements, e.g., radioactive isotopes. Tropospheric effects of atomic bomb tests are discussed in this regard. In a final section, calculations are presented for the development of an ion counter of maximum sensitivity. General considerations on the sensitivity of ion counters under given conditions are included. (Author abstract modified)

APTIC-23190

AIR POLLUTION—CHICAGO.

Manufacturing Chemists Association, Washington, D. C., Air Pollution Abatement Committee and Manufacturing Chemists Association, Washington, D. C., Water Pollution Abatement Committee, Proc. Mfg. Chem. Ass. 1952-53 Pollution Abatement Conf., 6p.

W. C. McCrone.
Identifiers: *Dispersion, *Chicago, *Smokes, Urban areas, Combustion products, Dusts, Winds.

The Chicago area has a serious air pollution problem, despite a favorable terrain and high average wind velocity. This high average velocity is responsible for dispersion in the atmosphere or large quantities of coarse and fine dust from streets, alleys, vacant lots, etc. In addition, a large part of the city's fuel burning equipment is antiquated and little care is taken to fire the fuel properly. These factors combined with coal of generally high volatile contents creates a severe smoke problem in the Chicago area. Since the worst offenders are small heating units and wind, reducing the industrial contribution to a practical minimum would not eliminate the air pollution problem in Chicago.

APTIC-23199

NEW METHODS FOR TRACING ATMOSPHERIC AEROSOL FORMATION FROM REACTIVE HYDROCARBONS.

For primary bibliographic entry see Field 03.

APTIC-23201

TURBULENCE STUDIES IN THE ATMOSPHERIC BOUNDARY LAYER.

In: Pacific Northwest Laboratory Annual Report for 1969 to the USAEC Division of Biology and Medicine. Volume II: Physical Sciences. Part I. Atmospheric Sciences. Battelle Northwest, Richland, Wash., Environmental and Life Sciences Div., p. 36-41, June 1970. 6 refs. CFSTI: BNWL-1307, Part I

T. W. Horst and C. E. Elderkin.
Identifiers: *Lower atmosphere, *Turbulence (atmospheric), Transport, Winds, Stability (atmospheric).

Five, 35-min periods were selected for analysis from 18 hr of micrometeorological data recorded during 1969. Necessary steps are outlined for obtaining the surface Reynolds stress from cup anemometer wind profiles taken over terrain requiring a zero-plane displacement correction. Directly measured values of the Reynolds stress at 16 m and 58 m were combined with the profile derived stress at 4 m to obtain a vertical gradient of momentum transport. This gradient agreed with estimates obtained from the averaged equation of motion in the direction of the mean wind except for the case of maximum thermal instability. Here the 35-min period sampled inadequately the lower frequency contributions to the Reynolds stress. (Author abstract)

APTIC-23202

REAL TIME HISTORIES OF DIFFUSING PLUMES AND PUFFS DETERMINED FROM USE OF AN INERT GAS TRACER SYSTEM.

In: Pacific Northwest Laboratory Annual Report for 1969 to the USAEC Division of Biology and

Medicine. Volume II: Physical Sciences. Part I. Atmospheric Sciences. Battelle Northwest, Richland, Wash., Environmental and Life Sciences Div., p. 6-10, June 1970. 7 refs. CFSTI: BNWL-1307, Part I

P. W. Nickola, J. V. Ramsdell Jr., and J. D. Ludwick.

Identifiers: *Diffusion, *Plume behavior, *Tracers, Ground level, Winds, Temperature (atmospheric), Radioactive tracers.

During the development of the Hanford inert-gas tracer system, 13 releases of krypton-85 were made. The field grid on which the tracer was released is shown schematically. A plume or puff of krypton-85 was released at the center of the sampling grid. Vertical profiles of wind and temperature were monitored on two nearby meteorology towers. In the case of plume releases, the source was a pressurized gas cylinder from which krypton was released at a controlled rate of about 1 Ci/min for 10-12 min. Puffs were generated by crushing quartz ampules containing the tracer with a guillotine-like device. As the puff or plume was carried downward, it was detected by 64 halogen-quenched Geiger-Mueller tubes. The raw Geiger counts were then relayed by coaxial cables to a computer for processing. Some sample results of the computer-processed field data are presented. They show a ground-level distribution of relative concentration of plume release with respect to time and direction from source, and (b) ground-level and vertical distributions of relative concentration following puff release.

APTIC-23206

THE EFFECTS OF SOURCE HEIGHT AND STABILITY ON PLUME CENTERLINE EXPOSURE

In: Pacific Northwest Laboratory Annual Report for 1969 to the USAEC Division of Biology and Medicine. Volume II: Physical Sciences. Part I. Atmospheric Sciences. Battelle Northwest, Richland, Wash., Environmental and Life Sciences Div., p. 2-6, June 1970. 3 refs. CFSTI: BNWL-1307, Part I

P. W. Nickola.

Identifiers: *Plume behavior, *Lower atmosphere, Altitude, Tracers.

During 1969, nine tracer releases were made from an elevation of 365 ft on a meteorology tower. Plume centerline exposures resulting from these releases are compared with centerline exposure from previous releases from heights between 23 and 185 ft. The results are presented in the form of graphs of exposure vs. travel time and exposure vs. distance from the source. Releases were primarily under stable conditions. The upper level releases show a maximum exposure which is smaller in magnitude than 85 ft releases but found at a greater distance from the source. At a distance of about 10 km, the source height is no longer significant.

APTIC-23207

THE URBAN 'HEAT-ISLAND'

Biometeorol. Proc. 3rd Int. Biometeorol. Congr., 1963, vol. 2, part 2, p. 616-624. 12 refs.

M. Parry.

Identifiers: *Heat-island, *Reading, Great Britain, Urban areas, Commercial areas, Residential areas, Smokes, Winds, Temperature (atmospheric), Turbulence (atmospheric), Density.

Results of a survey of local climate in Reading, England, are used to assess the causes of the varying strength of the urban warmth (heat island) in different parts of the town. Reading is largely residential and commercial, with some light industry, and, away from the old commercial nucleus and adjacent strips of older, densely packed housing, the urban texture is mostly relatively open, with family houses rather than flats and considerable green space in the form of gardens and parks. By grouping together stations of similar elevation, it is seen that, in terms of mean daily tempera-

tures, the urban excess is small (less than 1 F) and for maximum temperatures even less (about 0.5 F), mainly because wind and turbulence, which tend to suppress local differences, are normally at their maximum during the middle of the day. It is in the minimum temperatures that the largest urban-rural contrast is found, about 1.5 F, an average figure that conceals much larger differences that develop on suitable nights. There is no apparent relationship between mean minimum temperatures and mean smoke concentrations, nor of mean minimum temperatures and heat loss from buildings. For a town of this type, it is concluded that the density of the built-up area is the dominant influence on variations in the strength of the 'heat island' effect. (Author abstract modified)

APTIC-23215

DIFFUSION-PROCESSES UNDER CONDITIONS OF NATURAL TURBULENCE

Zh. Fiz. Khim., 20 (10):1137-1141, 1946. 9 refs.

Translated from Russian. Fort Detrick, Frederick, Md., 9p., Feb. 10, 1949. CFSTI, DDC: AD 681844

N. N. Tunkin.

Identifiers: *Aerosols, *Diffusion, *Turbulence (atmospheric), Ussr, Suspended particulates, Droplets, Particle size, Mathematical analyses, Brownian movement, Heat transfer, Particle growth, Temperature.

A brief discussion is presented of the effect of atmospheric turbulence on the coagulation of aerosol particles, the evaporation of aerosol particles, and the evaporation of droplets from the point of view of the isotropic turbulence concept. For sufficiently large particles, normal turbulence radically increases the number of collisions between particles. With increasing particle size, the number of collisions between them is rapidly increased as a result of turbulence. If the particles are very small, the speed of coagulation increases as a result of increased Brownian movement. In this manner, the coagulation of an aerosol in the atmosphere may serve as an example of a diffusion process in which the Brownian movement and the turbulent mixing are quantities of the same order. In another situation, a turbulent state of the atmosphere cannot have any effect on the kinetics of the evaporation of aerosol particles. In the evaporation of droplets, at small distances from the surface, turbulent diffusion does not play a noticeable role; the decisive significance belongs to the molecular diffusion. Away from the surface, the decisive role belongs to the turbulent exchange. For conditions of small temperature difference, this concept may be extended directly to the heat exchange process. Except in the case of very small droplets, the turbulent state of the atmosphere is a very real factor in actual processes of heat transfer.

APTIC-23230

WORLD-WIDE DISPERSAL OF POLLUTANTS. THE DISPERSION OF POLLUTANTS IN THE FREE ATMOSPHERE BY THE LARGE SCALE WIND SYSTEMS.

Phil. Trans. Roy. Soc. London, Ser. A., 265

(1161):273-294, Nov. 13, 1969. 32 refs.

R. J. Murgatroyd.

Identifiers: *Mathematical modeling, *Dispersion, *Winds, Great Britain, Mathematical analyses, Atmospheric movements, Pressure (atmospheric).

In order to include the effect of large (synoptic) scale vertical motions in investigation of the travel and dispersion of pollutants in the free atmosphere, a pilot theoretical study was conducted using the component wind fields given at the different time steps of a numerical forecast integration to construct suitable three-dimensional trajectories. The study was made at the 900, 700, 500, and 300 mbar pressure levels (90, 70, 50 and 30 kN/sq m) using the results of a 24-hr numerical forecast by the Meteorological Office's 10 level model. The use of constant level trajectories gave horizontal dispersions (variances of the trajectory end points relative to their centre of gravity) which

differed by only small amounts from those due to the three dimensional trajectories. The zonal variances exceeded the meridional variances by a small factor and both were 4 to 6 orders greater than those of the corresponding variances in the vertical. In each case for at least 12 to 18 hr they were all roughly proportional to the square of the time after release (the 'short time' case). The large scale clusters rapidly distorted at rates which increased with their initial size and also with the deformation components of the wind field. At these scales, deformation plays a major role in the apparent dispersion and the mean values of total deformation so obtained agreed satisfactorily with those calculated from a kinematic analysis of the horizontal wind field. (Author abstract modified)

APTIC-23236

ON THE PROBLEM OF THE SETTLING OF AN ARTIFICIAL AEROSOL CLOUD IN THE ATMOSPHERE.

Tr. Inst. Priklad. Geofiz. (Leningrad), no. 4:41-47,

1967. 7 refs. Translated from Russian. Foreign

Technology Div., Wright-Patterson AFB., Ohio,

Translation Div., 12p., Nov. 3, 1969. CFSTI,

DDC: AD 703172

A. N. Miroshkina, and G. M. Petrova.

Identifiers: *Deposition, *Aerosols, Ussr, Aircraft, Gravity settling, Inertial separation, Dispersion, Clouds, Stability (atmospheric).

An analysis is presented of data obtained during 29 experiments (from stationary sources and aircraft) on the rate of settling, the movement along trajectories and the positions, extent, and distance from the source of surface concentration maxima of artificial aerosol clouds. The aerosol used consisted of luminescent particles of polymethylmethacrylate released into the atmosphere at various speeds and during various weather conditions. The rate of settling of an artificial aerosol cloud exceeds by several times the rate of gravitational settling of its particle composition; the stratification of the atmosphere plays an essential role in the behavior of an aerosol particle cloud. The average settling rate of the cloud in an unstable atmosphere is 0.6 m/s. In stable stratification, the presence of an inversion layer and isotherms reduces the rate of 0.2-0.3 m/s. The results are discussed in terms of the atomization of finely dispersed particles from aircraft. Existing systems of spraying dust-like preparations are not likely to promote the formation of a settling cloud under an airplane. Intense spraying leads to the breakup of particles from the stream and their subsequent settling at Stokes's speed; 50-75% of the particles will be dispersed beyond the borders of the test tract, thus contaminating the environment.

APTIC-23244

PHOTOOXIDATION OF AROMATIC HYDROCARBONS.

Preprint, Public Health Service, Cincinnati, Ohio,

Div. of Air Pollution, and California State Dept. of

Public Health, Berkeley, 18p., 1961. 12 refs.

(Presented at the Conference on Motor Vehicle

Exhaust Emissions and Their Effects, Los

Angeles, Calif., Dec. 5, 1961.)

A. P. Altshuler, S. F. Sieva, and S. L.

Kopczynski.

Identifiers: *Smog, *Aromatic hydrocarbons, *Photooxidation, Olefins, Benzenes, Trimethylbenzene, Toluenes, Xylenes, Nitric oxide (no), Nitrogen dioxide (no2), Ozone, Photochemical reactions, Light radiation.

Ozone formation and conversion of nitric oxide to nitrogen dioxide in the presence of aromatic hydrocarbons, and reactivities of the aromatics, were measured to evaluate the smog-forming potential of aromatic hydrocarbons. The nitric oxide to nitrogen dioxide conversions were accomplished by irradiating plastic bags containing mixtures of nitric oxide and aromatic hydrocarbons or olefins between banks of warm-white, blacklight, and sunlight fluorescent lamps. The more reactive hydrocarbons, such as 1,3,5-

trimethylbenzene, m-xylene, and o-xylene, were as active as 1-alkenes in converting nitric oxide to nitrogen dioxide. Other aromatic hydrocarbons, such as isopropyl benzene, tert-butyl benzene, and benzene participated less effectively in the conversions. The order of reactivity bears some relation to the small bromination tendencies of aromatic hydrocarbons. The trend can also be related to the basicities of the aromatic hydrocarbons. In photooxidation experiments with long-path infrared cells, little if any ozone was formed when nitrogen dioxide was irradiated in the presence of benzene, toluene, or isopropylbenzene. However, cracking depths of 6 to 7 mm were found following irradiation in the presence of 1,3,5-trimethylbenzene, m-xylene, or o-xylene. The results indicate that the more reactive aromatics are as likely to participate in atmospheric smog reactions as olefins.

APTIC-23266

VALIDATION OF SCALING PROCEDURES FOR WIND TUNNEL MODEL TESTING OF DIFFUSION NEAR BUILDINGS. (TERMINAL PROGRESS REPORT).

New York Univ., N. Y. Geophysical Sciences Lab., NAPCA, Grant AP-00769-01, N.Y.U. Rept. TR-69-8, 1969p., Dec. 1969. 43 refs.

Identifiers: *Diffusion models, *Turbulence (atmospheric), *Wind tunnels, Buildings, Droplets, Design criteria, Mathematical analyses, Testing facilities, Point sources, Tracers, Winds, Flow rates.

Criteria for the design of wind tunnel model experiments and extrapolation of test data to full scale for the case of diffusion from a source near a sharp-edged building in a turbulent wind are derived by nondimensionalization of the differential equations of motion, continuity and diffusion, and the geometric and dynamic boundary conditions. The criteria are checked experimentally using a uranine dye tracer with a full scale building in an atmospheric wind and a gas tracer with a model of the same building in a wind tunnel. A large range of discrepancies between the two sets of data are found. The cause is traced to the inability of the field sampling system to capture larger aerosol drop sizes because of insufficient upward aspiration velocity. A detailed analysis shows very much smaller discrepancies at locations where up currents neutralized the settling velocity of larger drops. Full capture would result in discrepancies attributable to experimental scatter only; the proposed criterion may be considered to have been validated by the test. As part of the experimental program, means are developed to produce very thick boundary layers and turbulence intensities approaching atmospheric values over a large portion of the tunnel air stream. A mathematical technique is developed for calculating long time average concentrations in an atmospheric wind using concentration data measured in a low turbulence, steady air stream. (Author abstract modified)

APTIC-23277

ATMOSPHERIC DIFFUSION. INVESTIGATIONS AT STUDSVIK AND AGESTA, 1960-1963. Aktiebolaget Atomenergi, Studsvik (Sweden) and Swedish Meteorological and Hydrological Inst., Rept. AE-379, 91p., Dec. 1969. 14 refs.

L.-E. Haeggblom, Ch. Gyllander, and U. Widemo.

Identifiers: *Diffusion, *Plume behavior, *Studsvik, *Agesta, Sweden, Stacks, Ground level, Lower atmosphere, Meteorology, Stability (atmospheric).

Values for diffusion parameters and the resulting distribution in plumes are shown for different weather conditions during a release period of one hour, for stack heights of 25, 50, 75 and 100 m, and for release at ground level. The method and calculation principles are described, and factors such as the stability parameter, the effect of the stack, and the width of the plume are presented. The data is

also used for calculating release from buildings and for diffusion for short sampling periods.

APTIC-23279

DISPERSION AND PENETRATION OF POLLENS AND INDUSTRIAL CONTAMINANTS. (FINAL REPORT).

Michigan Univ., Ann Arbor, Engineering Research Inst., Contract AF 19(604)-792, Proj. 2160, 95p., Oct. 1956. 10 refs.

E. Wendell Hewson, and A. Nelson Dingle.

Identifiers: *Dispersion, *Penetration, *Suspended particulates, *Pollens, Allergies, Ragweed, Ventilation, Mathematical modeling, Ground level, Diffusion models, Winds, Turbulence (atmospheric).

An investigation of pollen dispersion and penetration is presented. A theoretical analysis allowing for relative motion of particles in turbulent flow is included. Clinical studies of ragweed-pollen allergy are described, and a survey of meteorological instrumentation is made. Field studies of particulate penetration into structures are based on the hypothesis that penetration is induced by a pumping action of atmospheric turbulence. Ragweed-pollen are the particulates employed for the study. Concentrations are counted by drawing air through a millipore filter and counting the grains under a microscope. Ground level wind speed and gustiness are measured and tabulated. Differential equations are developed to express ventilation rate parameters. (Author abstract modified)

APTIC-23281

TRANS-ATLANTIC SEDIMENT TRANSPORT BY WIND.

Columbia Univ., New York, Faculty of Pure Science, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1968, 189p. 162 refs.

David Winslow Folger.

Identifiers: *Transport, *Oceans, *Particulates, Settling particles, Chemical composition, Build-up rates, Dust fall, Particle size, Sampling methods, Sedimentation, Suspended particulates, Field tests, Winds.

The concentration, composition, and distribution of terrigenous detritus collected from air and surface water of the North Atlantic are analyzed in order to characterize the major wind and surface current regimes with respect to suspended components and thereby provide useful criteria for the interpretation of the marine sedimentary record. Techniques for sampling surface water suspensions are developed to contend with some of the problems encountered. Total suspended matter ranged from less than 0.05 mg/l to 0.8 mg/l. The importance of wind to equatorial deep-sea sedimentation is indicated by the similarity of metals present in dust falls; the presence of the same classes and genera of phytoliths and fresh water diatoms in sediments, dust falls, and in air and water samples collected across the Atlantic; and the compatibility of projected sedimentation rates. The size distribution of the samples is discussed, and the significance of the various components present is described. (Author abstract modified)

APTIC-23285

PHOTOCHEMISTRY OF OZONE.

National Physical Lab., New Delhi (India), Radio Propagation Unit, Scientific Rept. 47, 49p., May 31, 1969. 26 refs. CFSTI: N70-13849

A. P. Mitra.

Identifiers: *Mathematical analyses, *Ozone, *Photochemical reactions, Diurnal, Seasonal, Asia, Middle atmosphere, Transport, Reaction kinetics, Reaction mechanisms.

Photochemical calculations on mesospheric ozone are reviewed for oxygen only, oxygen-hydrogen, and oxygen-hydrogen-nitrogen atmospheres. Effects of vertical eddy transport included in recent works by Hestvedt (1962) and Shimazaki (1968) are discussed. In addition, photochemical models

of ozone are summarized in tabular form, as are reaction rates for ozone photochemistry in oxygen-hydrogen atmospheres. Diurnal and seasonal ozone variations and rates of production and loss of ozone are schematically illustrated. The close relation that exists between the ratio $n(O)/n(O_3)$ and negative ion and electron concentrations adds a new dimension to ozone photochemistry work. A remarkable similarity has been observed between LF phase variations during a solar eclipse and the computed variations in ozone concentration. Similarities also exist during sunrise and sunset. It thus seems possible to obtain synoptic information on mesospheric ozone from Xospheric parameters. (Author abstract modified)

APTIC-23290

ICE-FORMING NUCLEI AND RELATED AEROSOL STUDIES.

Quad. Ric. Sci., no. 46:1-83, 1968. 73 refs. CFSTI: N69-40719

Jan Rosinsky.

Identifiers: *Nucleation, *Ice, *Aerosols, Italy, Lakes, Mountains, Oceans, Droplets, Particle counters, Particle size, Ground level, Lower atmosphere, Diffusion, Transport, Clouds, Rain, Snow, Turbulence (atmospheric), Supercooling.

Studies of ice-forming nuclei and related aerosol studies are discussed. Ice nuclei originate from the earth's surface, from meteoritic particles, and from man-made aerosols, such as metallic oxide particles from smelters. The Bergson theory of rain formation is based on the growth of ice crystals in a cloud composed of supercooled droplets. Experiments involving ice nuclei counters are described. Measurements made at ground level on mountains, near lakes, above oceans, and at altitudes up to ten miles are reported. Other studies include particle trajectory, particles in rain, size distributions, turbulent diffusion, and hail. Future experiments will include studies of the mechanism of transport and of magnetic particles.

APTIC-23291

ECONOMIC STUDIES AND SOME TEST RESULTS FROM FOG DISSIPATION SYSTEMS IN FRANCE. (FINAL REPORT).

Rept. FAA-RD-70-16, 62p., April 1970. 1 ref.

Translated from French. Language Service, Inc.

CFSTI, DDC: AD 705077

Personal Author Not Recorded.

Identifiers: *Fog, *Cloud seeding, *Costs, France, Airports, Visibility, Dispersion, Temperature (atmospheric), Propanes.

Test results and economic studies of fog dissipation systems at French airports are presented. Fog dispersal operations conducted during limited visibility and temperatures less than 0°C confirm that 0°C is the efficiency threshold for a ground base device with liquid propane sprayers. A survey of past and present installations for dispersing positive (temperature greater than 0°C) fog using the Turboclar method is given. Chemical seeding is discussed as a dispersive measure. Economic studies of present and future systems demonstrate that they can be profitable. (Author abstract modified)

APTIC-23294

CONTROL OF AIR POLLUTION FROM INDUSTRIAL SOURCES.

Preprint, American Inst. of Plant Engineers, Cincinnati, Ohio, 13p., 1970. (Presented at the American Institute of Plant Engineers National Pollution Conference, New Brunswick, N. J., Sept. 23, 1970.)

Robert L. Harris Jr.

Identifiers: *Weather modification, *Sources, Governments, Urban areas, Dusts, Industrial emission sources, Solid waste disposal, Transportation, Temperature (atmospheric), Carbon dioxide, Solar radiation.

The generation of air pollution is related to numbers of people, the concentration of people in urban centers compounding the generation of pollutants by industrial processes, transportation, combustion of fuels, and disposal of solid waste. While the local effects of pollutants are in a sense reversible, other effects may be more far reaching and irreversible. Examples of the latter are the increased mean surface temperature of the earth between the late 1800's and World War II and the cooling of the atmosphere since the war. The first change is attributed to increased atmospheric concentrations of carbon dioxide; the second, to reduced solar radiation brought about by increased atmospheric dust. Possible consequences of these effects range from a melting of the polar ice caps to the reverse condition of a new ice age. Which catastrophic condition might occur depends on which pollutant effect might eventually predominate. The role of the Federal Government, the National Air Pollution Control Administration, state governments, and engineers in preserving the environment from such catastrophes is indicated. APTIC-23300

INVESTIGATIONS OF CONDENSATION NUCLEI AND THE CHEMICAL COMPOSITION OF ATMOSPHERIC PRECIPITATION.
Tr. Gl. Geofiz. Observ. (Leningrad), no. 218:266-276, 1967. 16 refs. Translated from Russian. Israel Program for Scientific Translations, Jerusalem, 11p., 1970. CFSTI: TT-68-50493
E. S. Selezneva

Identifiers: *Condensation (atmospheric), *Precipitation, *Nucleation, Ussr, Suspended particulates, Chemical composition, Lower atmosphere, Clouds.

A brief history of the investigation of atmospheric condensation nuclei is presented, and recommendations are made as to the direction of future studies in this area. The material covered is principally Russian in origin with some reference to non-Russian work. Maps are included to show the distribution of condensation nuclei over Russia and their sources are identified. Comment is made on the role of precipitation in stripping the lower atmosphere of soluble suspended particulates. APTIC-23304

ATMOSPHERIC TURBIDITY AFTER THE AGUNG ERUPTION OF 1963 AND SIZE DISTRIBUTION OF THE VOLCANIC AEROSOL.
J. Geophys. Res., 75 (27):5185-5193, Sept. 20, 1970. 53 refs.

Frederic E. Volz.

Identifiers: *Volcanoes, *Aerosols, *Turbidity, Dusts, Photometric methods, Particle size, Middle atmosphere, Diffusion.

Data on atmospheric transmission related to the stratospheric layer of aerosol from the explosion of the Agung volcano in March 1963 at Bali Island are discussed. In mid-latitudes of the southern hemisphere, the abnormal aerosol optical thickness at the 500 nm wavelength reached a peak of 0.3 during September 1963 but became very small after mid-1965. Some pyrheliometric data require consideration of the wavelength dependency of attenuation on the volcanic dust to conform to spectral data. Over the northern hemisphere, the decrease of transmission due to Agung aerosol was marginal, and a strong seasonal variation that had been derived from pyrheliometric data seems questionable. Observations of the brightness of the eclipsed moon and analysis of brightness of the umbra are in good agreement with the above data if referred to the proper hemisphere. Indications on the size distribution of the volcanic dust from wavelength dependence of dust attenuation and sky light observations are discussed. (Author abstract)
APTIC-23334

6. BASIC SCIENCE AND TECHNOLOGY

REACTIONS OF METHYL RADICALS WITH NITRIC OXIDE.

Can. J. Chem., 40:2012-2016, 1962. 18 refs.

D. E. Hoare.

Identifiers: *Nitric oxide (no), *Free radicals, *Reaction kinetics, Great Britain, Experimental methods, Acetone Chemical reactions, Photolysis, Methanes.

The reactions of methyl radicals, produced by photolysis of acetone at 200 C, with nitric oxide were studied. Both the rate of removal of methyl radicals and the rate of disappearance of nitric oxide were used to follow the reaction. The reaction $\text{CH}_3 + \text{NO} + \text{M}$ yields $\text{CH}_3\text{NO} + \text{M}$ was shown to be third order, with acetone as M. Only in the presence of low concentrations of nitric oxide will the reaction 2CH_3 yields C_2H_6 be of importance. It was also shown that the nitrosomethane formed reacts with either methyl radicals or nitric oxide. The probability of the occurrence of such reactions as $\text{CH}_3\text{CO} + \text{NO}$ yields $\text{CH}_3\text{CO}\cdot\text{NO}$ was shown. The rate constant found for the reaction was compared with those previously reported. APTIC-18251

CORRELATION OF EQUILIBRIUM DATA FOR THE SYSTEM $\text{SO}_2\text{-H}_2\text{O-CAO}$.

TAPPI, 40 (11):895-899, Nov. 1957. 10 refs.

W. A. Dickens, and A. W. Plummer.

Identifiers: *Sulfur dioxide, *Equilibrium, Calcium compounds, Water, Thermodynamics, Temperature, Vapor pressure.

A careful literature survey was made to locate equilibrium vapor pressure-composition-temperature data for the sulfur dioxide-water-calcium oxide system. Data thus obtained was statistically correlated by a modified Cox-Othmer method over a total SO_2 concentration range of 1-6 grams of $\text{SO}_2/100$ grams of water. The correlation was achieved by discarding the data of investigators, which differed significantly from the remaining data. The data are successfully correlated at different concentrations by a logarithmic equation. Values for the slopes and intercepts within these concentration ranges are presented. (Author abstract modified)
APTIC-19041

ON THE INITIAL REACTION OF CARBON MONOXIDE WITH LIQUID SODIUM.

Brookhaven National Lab., Upton, N. Y., 12p., Sept. 1969. 5 refs. CFSTI: BNL 50197 (T-548)

M. R. Hobdell, and I. Newman.

Identifiers: *Absorption, *Sodium compounds, *Carbon monoxide, Chemical reactions, Liquids, Reaction mechanisms.

Experiments on the initial reaction of carbon monoxide with liquid sodium attempted to find whether CO or sodium-CO compounds are sodium soluble. Absorption of CO equivalent to a few ppm in the metal could be detected. Three distinct reaction stages were evident, (1) an initial induction period, (2) a rapid uptake stage, and (3) a stage at which the uptake again became slow. The disappearance of surface films, the accompanying changes in the physical nature of the liquid sodium, and the distribution of the reaction product throughout the bulk metal, may indicate that a soluble species is involved. APTIC-19043

STUDY OF THE ACTIVATING ENERGY IN HETEROGENEOUS CATALYSIS.

(Ueber die Aktivierungsenergie in der Heterogenen Katalyse). Text in German. Z. Electrochem., 46 (6):369-373, 1940. 19 refs. Guenther Riensacker.

Identifiers: *Catalytic activity, Bismuth, Germany, Formic acid, Dissociation, Surface properties.

To study the influence of dispersion on activation energy, pulverized bismuth with grain sizes of less than 0.5 mm, 1 mm and more than 2 mm, as well as single crystal wafers, were used for the dissociation of formic acid. Activating energy was lower with disperse material than with compact material. The catalytic properties of nickel sheets were also studied, and rolled, hard metal sheets displayed higher activity and activation energy or the HCOOH dissociation than soft, annealed sheets. Comparison of the activation energy of HCOOH dissociation and ethylene hydration in the presence of Cu, Ag, Au, Ni, Pd, and Pt catalysts revealed that those metals known as good hydration catalysts also show high energy interactions between catalyst and substrate and vice versa. The same is true for dehydration. APTIC-19045

STUDY OF THE RELATIONSHIP BETWEEN CATALYST STRUCTURE AND CHEMICAL REACTION. II.

(Ueber Zusammenhaenge zwischen Katalysatorstruktur und chemischer Umsetzung). Text in German. Z. Elektrochem., 39 (7a):433-439, 1933. 22 refs.

J. Eckell.

Identifiers: *Catalytic activity, Nickel, Germany, Cooling, Crystal structure, Surface properties.

The influence of a cold shaping process on the catalytic activity of nickel sheets was studied. Nickel sheets of 99.1% nickel and 0.59% iron were rolled to a thickness of 0.1 mm, and some sheets were recrystallized at 900 C in a vacuum after the rolling process. The catalysts were used for ethylene hydration. A marked higher activity for the rolled nickel sheet was observed. The rolled and recrystallized nickel sheets were polished, and while the polishing had no specific influence on the rolled sheets, the activity of the recrystallized nickel sheets rose to that of the rolled sheets. Polishing and rolling can be assumed to cause lattice deformation, which in turn causes the charge distribution of the affected lattice atoms changed. The activity was independent of the size of the surface. APTIC-19046

REACTION OF O (1D) WITH N_2O .

Pennsylvania State Univ., University Park, Ionosphere Research Lab., NASA Grant NGL-39-009-003, Rept. 343, 12p., Nov. 15, 1959. 10 refs. CFSTI: N70-11899

R. I. Greenberg, and J. P. Heicklen.

Identifiers: *Nitrous oxide (n_2o), *Oxygen, *Reaction mechanisms, Chemical reactions, Photolysis, Reaction kinetics.

The reaction of singlet molecular oxygen produced from the photolysis of nitrous oxide at 2139 Å reacts with N_2O by the reaction $\text{O} (1\text{D}) + \text{N}_2\text{O}$ yields N_2 plus O_2 and $\text{O} (1\text{D}) + \text{N}_2\text{O}$ yields 2NO . The method of chemical differences was used to obtain an accurate measure of the ratio of reaction rates, k_2/k_3 , equal to 1.12 plus or minus 0.02. The quantum yield of producing triplet oxygen, $\text{O} (3\text{P})$, either from direct photolysis or deactivation of $\text{O} (1\text{D})$ by N_2O , is less than 0.02 and probably zero. (Author abstract modified)
APTIC-19133

EQUILIBRIUM BETWEEN NITROGEN OXIDES AND NITRIC ACID SOLUTIONS.

J. Appl. Chem. USSR (English Translation from Russian of: Zh. Prikl. Khim.), 41 (3):474-477, March 1968. 11 refs.

L. Ya. Tereshchenko, V. P. Panov, and M. E. Pozin.

Identifiers: *Nitric acid, *Nitrogen oxides, *Chemical reactions, Ussr, Chemical bonds, Oxidation, Reaction kinetics, Thermodynamics, Pressure, Temperature.

Data on equilibrium between nitrous gases and nitric acid solutions are very important for determining the rational conditions of conversion of nitrogen oxides. Equilibrium between nitrogen oxides and nitric acid solutions was studied over a wide range of partial pressures of nitrogen oxides and degrees of oxidation of the oxides, nitric acid concentrations, and temperatures; up to approximately 60% nitric acid concentration, the dependence of log K on the concentration is linear at the temperatures studied. Empirical equations are given for determination of log K and the logarithm of the overall equilibrium constant over a wide range of conditions. (Author conclusions modified)
APTIC-19137

SHOCK HEATING OF MIXTURES OF NITROUS OXIDE WITH CYANOGEN OR HYDROGEN CYANIDE.

Combust. Sci. Technol., vol. 1:415-420, 1970. 7 refs.

L. J. Drummond.

Identifiers: *Shock heating, *Nitrous oxide (n2o), Australia, Cyanides, Hydrogen, Nitrous oxide (n2o), Decomposition, Gases, Reaction mechanisms.

Reflected shock waves were used to heat argon-diluted mixtures of nitrous oxide with cyanogen or hydrogen cyanide at temperatures between 1500 and 2000 K. Absorption spectra which were obtained during the induction period preceding the explosion of C2N2-N2O-Ar mixtures, indicated the presence of CN and NCN radicals and also of another radical, assumed to be CNN, exhibiting bands at 4090 and 4270 Å. When reactant mixtures contained HCN instead of C2N2, absorption spectra indicated the presence of CN, NCN, NH, and OH during ignition delay. Bands to CNN at 4090 and 4270 Å were not apparent. The decomposition of nitrous oxide appears to be rate controlling during the ignition delay of C2N2-N2O-Ar mixtures and the appearance of NCN radicals suggests the importance of the reaction $CN + N2O \rightarrow$ yield $NCN + NO$. A proposed set of reactions occurring during the induction period of HCN-N2O-Ar mixtures suggests that this reaction and the reaction $NO + HCN \rightarrow$ yield $CN + HNO$ both contribute to controlling the overall rate. (Author conclusions modified)
APTIC-19307

THERMAL DECOMPOSITION OF N2O4 AND NO2 BY SHOCK WAVES.

J. Chem. Phys., 53 (2):515-518, July 15, 1970. 12 refs.

Elihu Zimet.

Identifiers: *Nitrogen dioxide (no2), *Decomposition, *Shock waves, Dissociation, Fluid flow, Reaction kinetics.

A study of thermal decomposition reactions involving nitrogen in both NO2 and N2O4 forms and the inert carrier gases argon or nitrogen with mole fractions less than 0.1 was carried out using the shock-wave method. Dissociation rate constants were determined for both carrier gases. The rate equation was chosen on the basis of earlier experiments. Incorporated in the results was the new application of fully dispersed shock waves and these weak waves produced more accurate results than the conventional use of partly dispersed shock waves. An analytical description of the flow fields agreed well with the experimental values which were determined by a light absorption technique.
APTIC-19327

EPR STUDY OF THE KINETICS OF THE FORMATION OF RADICALS FROM DIBENZOYL PEROXIDE ON POROUS GLASS.

J. Macromol. Sci. Part A, 4 (1):187-202, Jan. 1970. 18 refs.

Richard H. Wiley, Henning F. Proelss, and Raymond Chang.

Identifiers: *Peroxides, *Decomposition, *Reaction kinetics, Glass, Adsorption, Spectrometry,

Catalytic activity, Thermodynamics, Surface properties.

A study was undertaken to determine whether or not it is possible to evaluate the kinetics of formation of short-lived radical intermediates during thermal decomposition reactions by stabilizing the radicals on porous glass and following the intensity of the EPR signals obtained. Conditions were defined under which the radical signal derived from dibenzoyl peroxide could be followed over a temperature range suitable for kinetic studies. The kinetics of formation of radicals from dibenzoyl peroxide supported on porous glass were determined using EPR techniques over a temperature range of 25-100°C. Values of the activation energy of 18.5 and 25 kcal/mole were observed for two differently prepared porous glass support materials. The difference between these values and the thermal (solution) values of 29-31 kcal/mole may be related to surface adsorption energy, an induced decomposition reaction, a surface catalytic effect, or some combination of these.
APTIC-19443

STUDY OF CATALYSTS FOR THE UNION OF SULFURIC ACID FROM THE S.N.P.A. IN LACQ.

(Etude de catalyseurs pour l'unité d'acide sulfurique de la S.N.P.A. à Lacq.) Text in French. Ann. Genie Chim., 1967:162-174. 9 refs. (Presented to the Congr. Intern. du Soufre, Toulouse, 1967.) G. Desgrandchamps.

Identifiers: *Sulfur dioxide, *Catalysis, *Oxidation, France, Mathematical analyses, Hydrogen, Carbon monoxide, Sulfur trioxide, Oxygen, Reaction kinetics, Thermodynamics.

A study was conducted to compare the activities of three commercial catalysts for the conversion of sulfur dioxide to sulfur trioxide. Small SO2 concentrations, wet catalysis, and the presence of hydrogen and carbon monoxide were investigated. The gas composition was very close to that of an integral isothermal reactor. It was first verified that the presence of H2 and CO was not changing the thermodynamic equilibrium of the reaction by oxygen consumption nor by a temperature rise in the adiabatic converter resulting from the oxidation heat. The kinetics of the SO2 conversion in an integral isothermal reactor were studied. In the absence of H2 and CO the kinetic treatment of the results gave coefficients of equations that were in agreement with the isothermal behavior of the catalyst. When H2 and CO were present, the results were not altered over two of the catalysts. It seems that the three oxidations occurred in parallel, without reciprocal inhibition or competition for the catalyst. (Author abstract modified)
APTIC-19478

MECHANISM AND OPTIMUM CONDITIONS FOR THE OXIDATION OF SULFUR DIOXIDE ON VANADIUM CATALYSTS.

(Mecanisme et conditions optima d'oxydation du bioxyde de soufre dans les catalyseurs au vanadium.) Text in French. Ann. Genie Chim., 1967:221-231. 10 refs. (Presented to the Congr. Intern. du Soufre, Toulouse, 1967.)

Gueorgui Boreckov.

Identifiers: *Catalytic oxidation, *Vanadium compounds, *Sulfur oxides, Ussr, Catalysis, Reaction kinetics, Reaction mechanisms, Surface properties, Temperature.

The mechanism of the oxidation of sulfur dioxide by vanadium catalysts was studied, and optimum oxidation conditions were established for reaction mixtures of different composition. As determined by thermographic and 'derivatographic' studies of the systems V2O5 + K2SO4 and V2O5 + K2S2O7, oxidation of SO2 by vanadium catalysts takes place when the active portion of a catalyst is in the liquid state in solution in molten potassium pyrosulfate. This fact was further confirmed by an ESR signal of the VO(2+) ion in the catalyst at a temperature in excess of 470°C. Oxidation takes

place according to the oxido-reduction mechanism, and the adsorption of oxygen represents the boundary stage at temperatures below 540°C. This process is propagated in the liquid phase at a depth of about 600 Å; this depth reduces with the temperature. These results enabled the optimum pore structure of vanadium catalysts to be determined. The change in the composition of the catalyst and its phase transformations as a function of the composition of the reaction mixture explain the complexity of the kinetic aspects of the SO2 oxidation reaction. Variations in activation energy as a function of temperature were observed and reaction velocity was measured directly for different initial compositions of the reaction mixture. From the experimental data, a new kinetic equation was derived that, unlike the Socolova equation, is valid at low conversion rates. (Author abstract modified)
APTIC-19481

GENERATION AND CHARACTERIZATION OF AEROSOLS.

National Cancer Inst., Bethesda, Md. and Atomic Energy Commission, Oak Ridge, Tenn., Proc. Conf. Inhalation Carcinogenesis, Gatlinburg, Tenn., 1969, p. 123-172. 237 refs. (Oct. 8-11.)

Otto G. Raabe.

Identifiers: *Aerosols, *Aerosol generators, Particle size, Sampling methods, Cascade samplers, Impingers, Membrane filters, Centrifugal separators, Electrostatic precipitators, Electrostatic aerosol generators, Electron microscopy, Experimental methods, Radioactive radiation.

Common techniques for the generation and characterization of aerosols are reviewed, with emphasis upon the experimental nontherapeutic applications. The methods of aerosol generation described include dispersion from dry powders and dusts and the atomization of solutions and suspensions with various compressed air and ultrasonic nebulizers. Emphasis is placed upon the generation of aerosols of 'insoluble' forms under controlled conditions. Particular attention is given to the various methods of producing 'monodisperse' aerosols from liquids, including spinning disks, electrostatic dispersion, controlled condensation, and ultrasonic dispersion. The relationships between generation techniques and the resulting characteristics of the aerosols are summarized. The importance of aerosol characterization in the evaluation of inhalation problems, and the instruments and techniques used for such analyses are discussed with respect to the various standard experimental approaches. The uses of electrostatic and thermal precipitators for electron microscopic studies, of filter samples for gross analyses and of various dynamic samplers such as impactors, centrifuges, cyclones, elutriators, and aerosol centrifuges are reviewed. The various particle 'sizes' employed and common size distribution terminology are described with special concern for their relationships to the factors associated with the inhalation of toxic or radioactive materials. (Author abstract)
APTIC-19663

EMISSION FROM FAR-ULTRAVIOLET PHOTOLYSIS OF N2O, NO, NO2, CO, CO2, AND O2 4000-3000 Å.

J. Chem. Phys., 48 (5):2067-2070, March 1968. 14 refs. CFSTI, DDC: AD 675086

R. A. Young, G. Black, and T. G. Slinger.

Identifiers: *Ultraviolet radiation, *Emissivity, *Photolysis, Carbon dioxide, Carbon monoxide, Nitric oxide (no), Nitrogen dioxide (no2), Nitrous oxide (n2o), Oxygen, Ultraviolet spectrometry.

The emissions seen in the visible region (4000-8000 Å) during the photolysis of nitrous oxide, nitric oxide, nitrogen dioxide, carbon monoxide, and oxygen with xenon, krypton, argon, and mercury resonance lamps were cataloged. The photolysis vessel was a 1.5-liter flask constructed as a double Wood's horn: one horn faced the lamp; the other faced the spectrometer, which viewed the

bulb at right angles to the lamp axis. The distance from the lamp window to the center of the viewing region was 14 cm. Gas was pumped through the cell at a rate of 1 liter/sec, and a diluent of 2 torr Ar or He was used. The CO, CO₂, and O₂ were of high purity, and the N₂ was more than 99% pure; the principal impurity was N₂. The NO was condensed with liquid N₂, and the middle fraction was taken off during evaporation. The gases were all passed through a dry-ice acetone trap into the system. For the single experiment with NO₂, 99.5% pure gas was used, and was added to the system without trapping. The lamps were all excited with a 2450-Mc/sec microwave generator. Carbon monoxide and nitric oxide photolyzed at 1470 Å gave fluorescence spectra where the emission is produced from the (d₃Δ sub v equals 7) state of CO and from a number of little-known upper states of NO. Carbon dioxide photolysis gave the 5577 Å line of 0 (1S) at all wavelengths from 1048 to 1470 Å; at the longer wavelengths, the 0 (1S) was formed in a secondary process, as there is insufficient energy available during the initial dissociation. The NO₂ photolysis produced the N₂ first positive bands, the NO beta bands, and 0 (1S), depending on the photolyzing wavelength. In O₂ photolysis, the only emitting species was O₂ (b¹Σ_g⁺) presumably formed during 0 (1D) deactivation. (Author abstract modified)
APTIC-19760

THE SYSTEM CO PLUS CH₄ ON TUNGSTEN AT 2537 Å.

(Das System CO + CH₄ auf Wolfram bei 2537 Å). Text in German. *Chemiker Ztg.* (Heidelberg), 94 (4):129-135, 1970. 5 refs.
Hans-Dieter Breuer, Hasso Moesta, and Norbert Trappen.
Identifiers: *Methanes, *Carbon monoxide, *Photochemical reactions, Germany, Adsorption, Dissociation, Recombination, Ultraviolet radiation.

Studies of the system tungsten-carbon monoxide revealed such intense bathochromic changes of the effective wave lengths due to the higher adsorption heat of CO on W, that photoreactions of CO were observed already at 2537 Å. Reaction products include C₂O, CO₂, C₂O₂, C₃O₂, which can be formed only after a dissociation of CO molecules has taken place. The C- and O- atoms react with adjacent atoms forming the above products. During the adsorption of CO and methane on tungsten, the molecules such as carbon suboxide further react through association with hydrogen and larger molecules are formed. Further masses are formed through association of hydrogen atoms and/or hydrocarbon radicals with the products of the CO photoreaction. The occurrence of fragmentation peaks such as M equals 18 (H₂O⁺), M equals 29 (HCO⁺) and M equals 44 (C₂H₄O⁺) point to the presence of aldehydes.
APTIC-19801

A STUDY OF JETS OF ELECTRICALLY CHARGED SUSPENSIONS.

Environ. Sci. Technol., 4 (8):678-685, Aug. 1970. 11 refs.

Yong N. Lee, and Shao I. Soo.
Identifiers: *Suspended particulates, *Diffusion, *Electric charge, *Jets, Glass, Collectors, Aluminum oxides, Gases, Solids.

Experiments were conducted on laminar and turbulent jets of discharged suspensions of glass and alumina particles. The Reynolds numbers based on orifice diameter and gas velocity ranged from 300-3494; charge-to-mass ratios were 0.000001-0.001 C per kg. The effect of particulate diffusivity was indicated by the Schmidt number, which for glass particles has the value of 4.7 and 4.88 for a laminar jet; 0.61 and 0.75 for glass particles in a turbulent jet; and 1.1 for alumina particles in a turbulent jet. In laminar flow, diffusion of the particulate phase occurred due to fluid-particle interaction, perturbation of the flow field by the particles, and, to a negligible extent, Brownian flow. Diffusion of the

particulate phase on its jet boundary occurred throughout the entire region of turbulent motion of the jet. With the gaseous phase in turbulent motion, the random motion of the particulate phase was uncorrelated, and the particles behaved like a rarified gas even though the gaseous phase did not. The jet boundary of the particulate phase in the initial laminar region was limited to that of the gaseous phases based on the conservation of mass. At low Reynolds numbers particles charged by surface contact with the wall were sufficient to exhibit the effect of the electric field. Most particles charged in corona discharge were attracted back to the grounded ring electrode, and no satisfactory measurements were possible. Even a small charge on particles altered the jet spread considerably, suggesting the possibility of a hybrid type of dust collector using both charge and jet actions.
APTIC-19805

ELECTROLYSIS WITH FLOWING SOLUTION.

Electrochim. Acta, 13 (3):375-382, March 1968. 33 refs.

R. E. Sioda.
Identifiers: *Electroconductivity analyzers, *Electrolysis, Analytical methods, Anthracenes, Flow rates.

A new type of electrolytic cell with a flowing solution is described. The working electrode is composed of a piece of 80-mesh platinum grid rolled together to form a plug. The electrolyzed solution flows under gravitational force through the pores of the electrode. The reduction of K₃Fe(CN)₆ and of O₂, and the oxidation of 9, 10-diphenylanthracene, were employed to test the operation of the cell. The limiting currents of the reduction and of the oxidation are practically linear with respect to the flow velocity. The cell can be used for preparative electrolyses, especially in the case of unstable electrolytic products which decompose easily or react to form electro-active secondary species. Application of continuous electrolysis may result in considerable saving of time in comparison with ordinary 'batch' processes. When the efficiency of the cell is determined, the cell can be used for coulometric measurements and analytical purposes. (Author abstract modified)
APTIC-21445

FORMATION OF OZONE AND NITROGEN OXIDES IN TECHNICAL AND LIQUEFIED GASES UNDER IRRADIATION CONDITIONS.

J. Appl. Chem. USSR (English translation from Russian of: *Zh. Prikl. Khim.*), 41 (1):34-37, Jan. 1968. 12 refs.

M. T. Dmitriev.
Identifiers: *Nitrogen oxides, *Ozone, *Compressed gases, Corrosion, USSR, Oxygen, Chemical reactions, Light radiation, Pressure.

The formation of ozone and nitrogen oxides in technical and liquefied gases under the influence of radiation was investigated. The energy yield of ozone in oxygen increases with the dose rate and decreases with an increase of the integral dose. The average value of the ozone yield is 8 molecules/100 eV, which corresponds to an irradiation time of 55 minutes. The yield increases when the dose rate is greater than the integral dose. The ozone formed is stable under irradiation conditions, and is decomposed only by direct action. Under the influence of irradiation, nitrogen compounds are also formed by reactions of nitrogen dissolved in oxygen. The data from the experiments can be used for assessment of the corrosion of reactor materials, for selection of corrosion-resistant materials, and in calculations of ventilation and agitation efficiency. They can also be used for calculation of the additional consumption of liquefied gases for evaporation of residual coolant, and disconnection of the cooling plant to prevent formation of explosive mixtures during irradiation.
APTIC-21959

NITRIC ACID AND THE NITROGEN BALANCE OF IRRADIATED HYDROCARBONS IN THE PRESENCE OF OXIDES OF NITROGEN.

Preprint, American Chemical Society, Washington, D. C., 20p., 1969. 16 refs. (Presented at the American Chemical Society 158th National Meeting, New York, Sept. 1969.)

B. W. Gay Jr., and J. J. Bufalini.
Identifiers: *Nitric acid, *Hydrocarbons, *Nitrogen oxides, Adsorption, Chemical reactions, Hydrolysis, Photooxidation, Light radiation.

In the photooxidation of systems containing hydrocarbons and nitrogen oxides in air, nitrogen balances have been poor (i.e., the amount of nitrogen consumed cannot be accounted for as products). Often, however, only gas-phase organic nitrogen products are considered; when surface-adsorbed products are analyzed, the nitrogen balances are greatly improved. Nitric acid is the principal surface product. It is believed to be formed primarily by hydrolysis of a nitrogen pentoxide intermediate on wall surfaces. (Author abstract)
APTIC-21989

A STUDY ON THE SOLUBILITY OF GASES. REPORT NO. 2.

(Kitai no yokaido ni kansura kenkyu. Dai 2 ho). Text in Japanese. *Rikagaku Kenkyusho Iho* (Bull. Inst. Phys. Chem. Res., Tokyo), 9 (9): 697-730, Sept. 1930. 17 refs.

T. Horiuchi.
Identifiers: *Solubility, *Gases, Japan, Esters, Chlorinated hydrocarbons, Carbon tetrachloride, Aliphatic hydrocarbons, Acetylenes, Ethylene, Benzenes, Acetone, Temperature.

Experiments to measure the solubilities of gases and to confirm a theoretical equation were performed using ethane, ethylene and acetylene as solutes and carbon tetrachloride, chlorobenzene, benzene, acetone and methyl acetate as solvents. The experimental apparatus was a glass tube expansion manometer which had external diameters of one cm and a length of 20 cm. The temperatures used were 10, 25 and 40 °C. The curves of molecular volume (abscissa) versus solubility factor (ordinate) were convex for the solution of SO₂ and CCl₄, concave for SO₂ and acetone and for SO₂ and methyl acetate. The theoretical values were closer to the experimental values when the solutes and solvents were saturated or non-polarized compounds.
APTIC-22119

INFRARED SPECTROSCOPIC INVESTIGATIONS OF THE LIQUID SYSTEMS SO₃-H₂O AND SO₃-D₂O. 5. THE TEMPERATURE-DEPENDENT EQUILIBRIA IN THE LIQUID SYSTEM H₂SO₄-SO₃.

(Infrarotspektroskopische Untersuchungen an den flüssigen Systemen SO₃-H₂O und SO₃-D₂O. 5. Ueber die temperaturabhängigen Gleichgewichte im flüssigen System H₂SO₄-SO₃). Text in German. *Z. Anorg. Allg. Chem.*, 374 (2):113-124, May 1970. 11 refs.

K. Stopperka, and V. Neumann.
Identifiers: *Sulfuric acid, *Sulfur trioxide, Germany, Mixtures, Infrared spectrometry, Sulfur trioxide, Liquids, Temperature.

During investigations of the stability of sulfuric acid mists, the necessity arose to obtain accurate data on the temperature-dependent equilibria of the liquid system sulfuric acid-sulfur trioxide. An infrared absorption spectrographic study was carried out of H₂SO₄-SO₃ solutions with 0 to 100% SO₃ in increments of 10% (except for one step with 5% SO₃). Temperatures increased from 20 °C by 10 deg increments up to and including the respective boiling points. To withstand the chemical attack of the solutions at the test temperatures, a special cuvette was designed in which the solution to be analyzed was placed in an annular container surrounded by a heating mantle with a ther-

mostatic temperature control. This, in turn is surrounded by and communicates with a hollow, 2.5 micron thick (at 20 C), 25 mm diameter space bounded by two 1 mm thick, 25 mm diameter discs of pure silicon and assembled by a very ingenious method. Sets of infrared absorption spectra of H₂SO₄-SO₃ solutions with 0.5, 40, 50, 80, and 100% SO₃ are presented graphically. Their correlation with the aid of data obtained by a compensation cuvette, as well as their interpretation, are discussed at some length. The information provided by the spectra is presented tabularly, confirming and supplementing previous findings. APTIC-22154

THE ELECTROCHEMICAL PROPERTIES OF OXIDES OF NITROGEN IN ORGANIC ENVIRONMENTS. OXIDATION OF THE NITRITE ION.

(Les propriétés électrochimiques des composés oxygénés de l'azote en milieux organiques. Oxydation de l'ion nitrite). Text in French. CR Acad. Sci., Paris, Ser. C, 270 (22):1773-1776, June 1970. 13 refs. Georges Cauquis, and Denis Serve. Identifiers: *Nitrites, *Oxidation, *Ions, France, Nitromethane, Nitrogen dioxide (no2), Hydrolysis, Electrolysis, Ionization, Reaction mechanisms.

In nitromethane, the negatively charged nitrite ion NO₂ oxidizes on an electrode of polished platinum in the form of nitrogen tetroxide, N₂O₄. The transfer of the charge is accompanied by the reaction of this tetroxide with the NO₂ ion and by hydrolysis reactions attributed to the residual water. The importance of these secondary reactions can be modified by adding various reactants to the solution. During the electrochemical oxidation of the nitrite ion in an argon atmosphere, several transitional radicals were detected by electromagnetic resonance techniques. APTIC-22158

THE SELF-PRESERVING PARTICLE SIZE DISTRIBUTION FOR COAGULATION BY BROWNIAN MOTION-III. SMOLUCHOWSKI COAGULATION AND SIMULTANEOUS MAXWELLIAN CONDENSATION.

Aerosol Sci., vol. 1:115-126, 1970. 21 refs. (Presented at Un colloque international sur les atmosphères polluées, Paris, France, Nov. 27-28, 1969.) J. Pich, S. K. Friedlander, and F. S. Lai. Identifiers: *Particle size, *Condensation, *Particle growth, Aerosols, Brownian movement.

A theoretical study was made of the dynamics of coagulation with simultaneous condensation and of the behavior of the particle size distribution function. For coagulation and condensation in the continuum region the existence of self-preserving spectra C, which includes the parameters viscosity, temperature, Boltzmann's constant, total volume concentration, total number of particles, proportionality coefficient, and supersaturation. For C equal to 0, phase equilibrium exists while for C greater than 0 simultaneous condensation and coagulation occur. For C equal to 1.09 the total surface concentration (surface area of particles per unit volume of gas) is invariant with respect to time. For other values of C the supersaturation must vary with time in a particular way in order for the system to be self-preserving. The shapes of the self-preserving spectra are strongly dependent on C. Analytical solutions of the transformed kinetic equation were found for the lower and upper ends of the spectrum and numerical solutions for the entire spectrum were calculated for four values of C. The theory is limited to values of C smaller than of order unity. (Author abstract modified) APTIC-22164

DETERMINATION OF CARBON-13 BY INFRARED SPECTROPHOTOMETRY OF CARBON MONOXIDE.

Anal. Chem., 42 (11):1192-1193, Sept. 1970. 8 refs.

Robin S. McDowell.

Identifiers: *Carbon black, *Infrared spectrometry, *Carbon monoxide, *Isotopes, Mathematical analyses.

The R (13) lines in the vibrational fundamentals of 12-carbon monoxide and 13-carbon monoxide occur at 2193 and 2144 reciprocal cm, respectively, and have been selected as being sufficiently free from interference to serve for the determination of the carbon-13/carbon-12 ratio. From the theory of line intensities and a consideration of the effect of spectrometer resolution on the line shape, one can establish that C-13/C-12 equals $1.023 (s^2 A^2 / \lambda^2)$, where s is the spectral slit width, A is the peak absorbance, and the primed quantities refer to 13-CO. A series of analyses on samples with C-13/C-12 in the range 0.01-0.20 gave results which agreed to within about 2% of mass spectrometric determinations and had relative standard deviations of about 6%. (Author abstract) APTIC-22337

CHEMICAL PROPERTIES OF AIR POLLUTANTS.

(Propiedades químicas de los contaminantes atmosféricos). Text in Spanish. Gac. Med. Mex., 100 (3):262-265, March 1970.

Armando Baez.

Identifiers: *Nitrogen oxides, *Ozone, Particulates, Sulfur oxides.

The chemical properties of particulates and gaseous air pollutants are reviewed. Suspended particles vary in diameter from 0.002 micron to 500 micron. Particulate pollution can be of 3 types: 1) toxic material, 2) inert material that interferes with the expulsion of other particles from an organism, and 3) particles that provide transport for toxic substances. The gases discussed are ozone and the oxides of sulfur and nitrogen. APTIC-22420

PULSE RADIOLYTIC STUDY OF NO-OXIDATION AND OF THE EQUILIBRIUM N2O3 YIELDS NO PLUS NO2 AND ITS REVERSE IN AQUEOUS SOLUTION.

(Pulsradiolytische Untersuchung der No-Oxydation und des Gleichgewichts N2O3 gleicht NO und NO2 und dem Gegenteil in wässriger Lösung). Text in German. Ber. Bunsenges. Physik. Chem., 74 (5):488-492, May 1970. 13 refs. M. Graetzel, S. Taniguchi, and A. Henglein. Identifiers: *Nitric oxide (no), *Nitrogen dioxide (no2), *Nitrous anhydride (n2o3), *Equilibrium, Germany, Nitrous anhydride (n2o3), Chemical reactions, Oxidation, Reaction kinetics, Reaction mechanisms.

Nitric oxide in aqueous solution was oxidized by the hydroxyl radical resulting from the radiolysis of water in a pulse radiolytic apparatus equipped to measure optical absorption and electrical conductivity of short-lived particles to determine whether the oxidation resulted in the formation of NO₂ (-) plus H (+) or of NO (+) plus OH (-). The first reaction took place without NO (+) being formed as an intermediate product. Experiments with solutions containing both NO (+) and NO₂ (-) disclosed that nitrogen dioxide which formed through oxidation of NO₂ (-) reacted with NO (+) until an equilibrium of NO plus NO₂ and N₂O₃ was reached with an equilibrium constant of 0.00073 M. The rate constant of the pseudo-first order of the saponification of N₂O₃ was 530/s and the constant of the N₂O₄ plus 2NO and N₂O₃ equilibrium 0.00035 M. APTIC-22421

THEORIES ON THE SENSE OF SMELL. PART II.

(Kyukaku ni kansuru gakusetsu (2)). Text in Japanese. Akushu No. Kenkyu (Odor Res. J. Japan), 1 (2):1-8, June 20, 1970. 7 refs. Part I, Ibid., 1 (1):9-15, April 20, 1970. Masaaki Yoshida. Identifiers: *Odorimetry, *Olfaction, Japan, Odors, Mathematical analyses.

Theories of the interaction between molecules in olfaction are presented. Amoore assumed that the sensory organ has holes for odorant molecules of a particular size, configuration, and electrical affinity. He formulated the similarity of the smell and the similarity of the chemical structure of various odorant molecules. Some correlations between the two were found. Johnston showed that an odor named woody note can be synthesized by blending the 7 standard smells defined by Amoore. Wright assumed that there are 25 fundamental smells detectable by the human nose. The total wave number range covers 0.80-0.650 cm, which is divided into 25 sections of 0.8-0.50 cm width, each overlapping with the adjacent ones. Benzonitril, nitrobenzene, and benzaldehyde were chosen, and their normal mode frequencies less than 0.500 cm were listed. All of the three had frequency regions of 0.174 plus or minus 0.002, 0.225 plus or minus 0.004, and 0.400 plus or minus 0.0003 cm in common. Wright asserted that these frequencies give the almond smell which is common to the three substances. A psychological experiment was also performed in order to establish the theory. APTIC-22429

THEORIES OF THE SENSE OF SMELL. PART I.

(Kyukaku ni kansuru gakusetsu (1)). Text in Japanese. Akushu No. Kenkyu (Odor Res. J. Japan), 1 (1):9-15, April 20, 1970. 5 refs. Part II, Ibid., 1 (2):1-8, June 20, 1970. Masaaki Yoshida. Identifiers: *Olfaction, Membranes, Nervous system, Japan, Odors, Chemical reactions, Electrical properties.

Theories on the mechanism of electrical changes in the neuron receiving odoriferous molecules, different reaction patterns by different molecules, and the properties of the molecules with respect to threshold value, intensity, and characteristic of the odor are reviewed, together with the classification and description of the odor. The impulse traveling through the nerve fiber from the olfactory membrane is of the order of 0.07 v. Since the membrane of the nerve cell is only several molecules thick, the field intensity in the membrane is of the order of 100,000 volt/cm. The field instantaneously vanishes when the pulse passes, and recovers by ion exchange between the inside and outside of the nerve cell. The impulse is not amplitude modulated, but is frequency modulated. Physiologists unanimously agree up to this point as to the general mechanism, but the mechanism of impulse generation at the terminal of nerves in the nose is not yet clarified. Chemical reactions, enzymes and stereostructure theories have been proposed in order to explain the generation of the impulse. Some people considered an indirect action, such as, vibration, wave, or radiation. Some of the strong theories recognizing the phenomenon as an interfacial one or interaction between the molecules are also explained. APTIC-22430

AN INFRARED SPECTROSCOPIC STUDY OF THE MECHANISM OF THE OXIDATION OF CARBON MONOXIDE ON CHROMIUM (III) OXIDE.

Kinetics Catalysis (USSR) (English translation from Russian of: Kinetika i Kataliz), 10 (6):1103-1108, Nov.-Dec. 1969. 13 refs. A. A. Davydov, Yu. M. Shchekochikhin, and N. P. Keier. Identifiers: *Carbon monoxide, *Chromium oxides, *Catalytic oxidation, Ussr, Adsorption, Infrared spectrometry, Carbonates, Carbon dioxide, Oxygen, Chemical bonds, Reaction mechanisms, Temperature.

Infrared spectroscopy was used to study the reaction of carbon monoxide, carbon dioxide, and oxygen mixtures with oxidized and degassed surfaces of chromium oxide. The reaction with the oxidized surface begins at lower temperatures than that with the degassed surface. The adsorption of CO on the oxidized surface leads to the for-

mation of surface carbonate-carboxylate compounds. The temperature of decomposition of the structures formed is determined by the strength of the bond formed by the atoms of the adsorbed oxygen with the surface, forming part of the structure of these compounds. A decrease in the temperature of the desorption of the surface carbonate-carboxylate structures is observed when the oxidation of CO to CO₂ is carried out under static conditions. The mechanism of the oxidation of CO to CO₂ on chromium oxide is discussed. (Author abstract)
APTIC-22432

PORE-SIZE DISTRIBUTION IN TYPICAL ADSORBENT SYSTEMS.

J. Colloid Interface Sci., 33 (4):508-519, Aug. 1970. 20 refs.
D. Dollimore, and G. R. Heal.
Identifiers: *Adsorption, *Mathematical analyses, *Pore-size distribution, Great Britain, Aluminum silicates, Nitrogen.

Pore-size distribution data are calculated from nitrogen desorption isotherms on 36 samples of silica and alumina. Several methods for calculating t , the thickness of an adsorbed layer, are proposed, but all suffer from uncertainties and no one method can be taken to be universally applicable to all adsorbents. The effect upon the distribution results produced by changing the method for the calculation of t is shown. It is convenient, but not necessarily theoretically correct, to take a comparison of cumulative area and BET area as a basis for the choice of the best values for t . From this comparison and an examination of the smoothness of the distribution curve, the expression for t in picometer (pm) give by de Boer is recommended. (Author abstract modified)
APTIC-22526

DISPROPORTIONATION OF CO. I. OVER IRON AND SILICON-IRON CRYSTALS.

J. Catalysis, 18 (2):164-183, Aug. 1970. 37 refs.
G. D. Renshaw, C. Roscoe, and P. L. Walker Jr.
Identifiers: *Iron compounds, *Carbon monoxide, *Disproportionation, Bib, Carbides, Iron oxides, Catalytic activity, Ions, Reaction kinetics, Reaction mechanisms, Crystal structure, Temperature.

A detailed study of the catalytic disproportionation of carbon monoxide over iron and 3.5% silicon-iron single crystals in the range 550-800°C was made. For both Fe and Si-Fe it is demonstrated that gamma-ferric oxide is the active catalytic species. It is considered that the defect type structure associated with this oxide aids the diffusion of Fe ions to the surface where they may facilitate the breakdown of CO molecules. The notable reduction in rate of reaction at temperatures above 550°C is a direct result of the formation of alpha-ferric oxide in which the diffusion of Fe ions is considerably less than in gamma-ferric oxide. Electron microscopy and selected area diffraction studies of the highly fibrous carbonaceous products formed at various stages in the reaction revealed that, at 550°C, the reaction proceeds via the breakdown of iron carbide whiskers (predominately) and platelets. The overall reaction is discussed in terms of the conditions necessary for the formation of the particular Fe oxides and the growth and reactions of Fe carbides. (Author abstract modified)
APTIC-22528

DETERMINATION OF MICROCONCENTRATIONS OF PARA-NITROANILINE IN THE ATMOSPHERE IN THE PRESENCE OF AMINO AND NITRO DERIVATIVES OF BENZENE.

(Opredeleniye mikrokoncentratsiy para-nitroanilina v atmosfere vozdukh v prisutstviy aminov i nitroproizvodnykh benzola). Text in Russian. Gigiena i Sanit., no. 6:50-51, 1970. 1 ref.
N. G. Andreyeshcheva.
Identifiers: *Para-nitroaniline amines, *Photometric methods, USSR, Amines.

Determination of p-nitroaniline as p-dimethylaminobenzaldehyde in an acid medium is described. Visual detection of 0.25 millimicrograms/2.2 ml is possible while photoelectric determination gives a sensitivity of 0.04 millimicrograms/ml. This method is not sensitive to the presence of ammonia, benzene, aniline, nitrobenzene, nitrochlorobenzene, chloroaniline, or a m-nitroaniline.
APTIC-22529

THE EFFECT OF ISOTOPIC SUBSTITUTION ON THE FLAME SPEEDS OF HYDROGEN-OXYGEN AND HYDROGEN-NITROUS OXIDE FLAMES.

Combust. Flame, 14 (3):361-374, June 1970. 34 refs.
P. Gray, Susan Holland, and D. B. Smith.
Identifiers: *Isotopic substitution, *Flame speeds, *Transport, *Reaction kinetics, Great Britain, Hydrogen, Nitrous oxide (N₂O), Oxygen, Combustion, Isotopes.

Flame speeds relative to the burned gas were measured at subatmospheric pressures over the whole range of flammability for four systems: hydrogen plus oxygen, deuterium plus oxygen, hydrogen plus nitrous oxide, and deuterium plus nitrous oxide. Measurements were made in a closed vessel, with a schlieren technique used in conjunction with a rotating-drum camera. Composition limits of flammability at 50 mm and 70 mm Hg were also determined, adiabatic flame temperatures and burned gas compositions calculated, and transport properties measured or computed. Substantial isotope effects were found on the flame speeds for both oxidants (O₂ and N₂O); deuterium flames were much slower over the whole composition range. For oxygen systems the ratio of flame speed of the hydrogen and deuterium system is around 1.4 over most of the composition range, rising above 1.5 in the richest mixtures. For nitrous oxide systems, the ratio is around 1.3, rising above 1.4 in the richest mixtures. The differences in flame speeds do not arise from isotope differences in flame temperature, for although more energy is liberated in its formation, D₂O also has a greater specific heat than H₂O and, except in the richest mixtures, differences in flame temperature are insignificant. Nor do isotope differences in thermal conductivity play a major role: both ab initio computations and experimental measurements suggest only about 10% differences in conductivity, i.e., 3% consequential changes in flame speed. The observed effects are to be interpreted in terms of the transformation (kinetic isotope effects on elementary reactions) and transport (diffusivity) of the species concerned. (Author abstract modified)
APTIC-22544

CHANGES IN PARTICLE SIZE DISTRIBUTION OF AEROSOLS FLOWING THROUGH VESSELS.

Kyoto Univ., Japan, Engineering Research Inst., Rept. 149, 10p., March 1970. 17 refs.
Kanji Takahashi.
Identifiers: *Particle growth, *Fluid flow, *Aerosols, *Particle size, Japan, Brownian movement.

A knowledge of changes in the particle size distribution of aerosols and of its equilibrium state are of importance in order to analyze the behavior of aerosols. The particle size distribution can be changed by many physical conditions such as the mixing pattern, the flow pattern of the medium, the pattern of field forces, and the boundary surfaces. In the case of small aerosol particles, Brownian coagulation and diffusional deposition onto the boundary surfaces are the most predominant mechanisms. Changes in particle size distribution of aerosols flowing through various sized test vessels are investigated as a function of time, both theoretically and experimentally. Brownian coagulation is taken into consideration for the numerical computation. Computational results are in fairly good agreement with those of the experiments. The equilibrium particle size distribution is

recognized in all cases, and the existence of the self-preserving size distribution function is proved. (Author abstract modified)
APTIC-22546

NUMERICAL CALCULATION FOR ELECTRICAL CHARGE ON AEROSOL PARTICLES.

Kyoto Univ., Japan, Engineering Research Inst., Rept. 147, 21p., Oct. 1969. 7 refs.
Akira Kudo, and Kanji Takahashi.
Identifiers: *Electrical mobility, *Number fraction, *Aerosols, Japan, Particle size, Mathematical analyses, Electrical properties.

In many investigations in aerosol engineering it is necessary to know the number fractions and electrical mobilities of uncharged and multi-charged particles. The mobility of a charged particle is affected by the number of charges and by the resistance of the air to the motion of the particles. Computation of the number fractions and mobility is rather laborious, so in practice tables and graphs are used. These are given for charged and uncharged particles as a function of particle radius in the range of 0.001 to 10.0 microns. A description of the theory and parameters used in the computations is included.
APTIC-22548

CALCULATED DIPOLE-MOMENT FUNCTIONS AND THE INFRARED INTENSITIES OF HCN AND N₂O.

J. Chem. Phys., 53 (4):1413-1417, Aug. 15, 1970. 17 refs.
Roy E. Bruns, and Willis B. Person.
Identifiers: *Dipole moments, *Hydrocyanic acid, *Nitrous oxide (N₂O), Mathematical analyses, Infrared radiation, Reaction kinetics, Electrical properties.

The dipole moments of hydrogen cyanide and nitrous oxide are computed for different geometric configurations of these molecules, using the best available wave functions from the 'near-Hartree-Fock' calculations. From these calculated dipole-moment functions the derivatives with respect to stretching coordinates of each molecule are computed and compared with the experimental values obtained from infrared intensity measurements. The absolute magnitudes of the calculated derivatives for both HCN and N₂O agree reasonably well with the experimental values. The relative signs of the calculated derivatives appear to be in agreement with the experiment for N₂O, but the signs are not consistent with experimental results for HCN. Possible reasons are suggested for this discrepancy, which appears to be more serious than the recent controversy regarding the sign of the carbon monoxide dipole moment. (Author abstract modified)
APTIC-22643

ELECTRIC POLARIZABILITY ANISOTROPIES OF NITROUS OXIDE, PROPYNE, AND CARBONYL SULFIDE BY MICROWAVE SPECTROSCOPY.

J. Chem. Phys., 53 (6):2513-2519, Sept. 15, 1970. 16 refs.
LeRoy H. Scharpen, John S. Muentner, and Victor W. Laurie.
Identifiers: *Electric polarizability anisotropies, Spectrometry, Carbonyls, Propynes, Nitrous oxide (N₂O), Sulfides, Reaction kinetics, Electrical properties.

Very accurate Stark effect measurements were made on rotational transitions of nitrous oxide and propyne-d₃. Measurements were made with a microwave spectrometer incorporating a special parallel-plate absorption cell capable of sustaining large magnitude electric fields and of producing very homogeneous fields in the absorption region. Analysis of the data yields an electric polarizability anisotropy of 3.222 plus or minus 0.046 Å for nitrous oxide and 2.7 plus or minus 0.6 Å for propyne-d₃. Stark effect data reported previously

for carbonyl sulfide were reanalyzed using a refined method of statistical analysis and the new molecular beam value for the dipole moment to determine the revised polarizability anisotropy. In each case the error limit represents the 95% confidence level calculated in the least squares analysis, but does not include the uncertainty in the dipole moment value for carbonyl sulfide which was used as a standard in the data reduction. (Author abstract modified)
APTIC-22644

THE LOWER CLOSURE POINT IN ADSORPTION HYSTERESIS OF THE CAPILLARY CONDENSATION TYPE.

J. Colloid Interface Sci., 33 (4):611-614, Aug. 1970. 17 refs.

C. G. V. Burgess, and D. H. Everett.
Identifiers: *Adsorption hysteresis, *Capillary condensation, *Closure point, Great Britain, Adsorption, Liquids, Tensile strength.

Most existing theories of the position of the lower closure point in capillary condensation hysteresis relate the position to the pore structure of the adsorbent and to the molecular size of the adsorptive. An alternative suggestion attributes the closure point to limitations imposed on the capillary condensation mechanism by the tensile strength of the liquid adsorbate. The present study suggests that the tensile strength of a capillary condensed liquid can be calculated from the relative vapor pressure corresponding to the lower closure point of the adsorption hysteresis loop obtain when the substance is adsorbed by a porous solid. The ratio of the tensile strengths to the critical pressure in a series of liquids, when plotted against reduced temperatures, fall between the curves corresponding to the van der Waals and the Berthelot equations of state, and close to that derived from an improved equation of state suggested by Guggenheim. (Author abstract modified)
APTIC-22650

THE EFFECT OF BROWNIAN COAGULATION, GRADIENT COAGULATION, TURBULENT COAGULATION, AND WALL LOSSES UPON THE PARTICLE SIZE DISTRIBUTION OF AN AEROSOL.

J. Colloid Interface Sci., 33 (4):529-538, Aug. 1970. 28 refs.

Chao-Ming Huang, M. Kerker, and E. Matijevic.
Identifiers: *Particle growth, *Aerosols, *Particle size, Mathematical analyses, Brownian movement.

Numerical solutions were obtained for the particle size distribution of an aerosol undergoing (1) Brownian coagulation plus wall loss, (2) gradient coagulation, (3) Brownian coagulation plus gradient coagulation, and (4) turbulent coagulation. For a relatively monodispersed aerosol, the various coagulation mechanisms were found to predict a similar result -- the appearance of a second mode in size distribution as coagulation progresses. When the distribution is broader, this second mode does not appear. The effect of surface loss is to decrease the particle concentration more rapidly than for pure Brownian coagulation, but to sharpen the size distribution. High surface loss also results in loss of the second mode. Gradient coagulation shifts the primary mode of the size distribution toward the lower particle sizes. At the same time, the distribution has more of the largest particles than does Brownian coagulation. The half-life time for gradient coagulation decreases approximately linearly with the velocity gradient and the cube of the particle size. For the aerosols under consideration, a velocity gradient of 10,000 reciprocal min or greater is needed to produce appreciable effects on coagulation rate comparable to purely Brownian coagulation. The necessary turbulent constant is at least 10 to the seventh power reciprocal cm reciprocal min. (Author summary modified)
APTIC-22651

ISOTOPE EXCHANGE IN CARBON MONOXIDE MOLECULES OVER ZINC AND FERRIC OXIDES.

(Reaktsiya izotopnogo obmena v molekulakh okisi ugleroda na oksidakh tsinka i zheleza). Text in Russian. Kinetika i Kataliz, 11 (3):683-691, 1970. 5 refs.

V. N. Nekipelov, and L. A. Kasatkina.
Identifiers: *Carbon monoxide, *Catalysis, *Isotopes, Ussr, Zinc compounds, Iron oxides, Reaction kinetics, Pressure.

Studies of the kinetics of isotope exchange in CO molecules over ZnO, Fe₂O₃, and Fe₃O₄ at temperatures of -196 to 4000 C and pressures of 5-200 mm Hg are reported. Empirical values for exchange rate, activation energy, and reaction order as functions of CO pressure are given. Reaction over ZnO at 25 C decreases by a factor or more than three in the course of 300 hours, but vacuum regeneration of the catalyst completely restored the original activity. Catalytic effectiveness was found to be about the same for Fe₂O₃ and Fe₃O₄ plus Fe. Data on isotope exchange between CO and Fe₂O₃ are also given.
APTIC-22658

VIBRATIONAL POPULATION INVERSION OF CO IN A FREE-BURNING CS₂/O₂ FLAME.

J. Chem. Phys., 53 (6):2539-2540, 1970. 7 refs.

K. D. Foster, and G. H. Kimbrell.
Identifiers: *Carbon monoxide, *Oxygen, *Carbon disulfide, *Vibrational population inversion, Canada, Nitrogen, Chemical reactions, Infrared radiation, Electrical properties.

The spark or flash-induced reaction of carbon disulfide with oxygen is of interest primarily because laser oscillation of vibration-rotation lines of carbon monoxide has been observed. The observation of a complete population inversion of certain vibrational levels in a product molecule produced in a free-burning flame is reported. The results are obtained by observing the infrared chemiluminescence of a CS₂/O₂ flame in the CO overtone region; the radiation is viewed in a direction transverse to the gas flow. The addition of nitrogen to the flame can result in complete vibrational population inversion. The CS₂/O₂/N₂ system appears to be a likely candidate for the achievement of laser oscillation in a free-burning flame.
APTIC-22660

ON THE NATURE OF SULPHUROUS ACID.

Can. J. Chem., vol. 36: 1121-1125, May-Aug. 1958. 24 refs.

Michael Falk, and Paul A. Giguere.
Identifiers: *Sulfurous acid, Canada, Infrared spectrometry, Inorganic acids, Sulfur dioxide, Water.

Repeated attempts to detect by infrared spectrometry stable sulfurous acid molecules in aqueous solutions of 'sulfurous acid' or in frozen mixtures of sulfur dioxide and water yield only negative results. Sulfur dioxide dissolved in water exists mostly in the molecular state. There is very little interaction between SO₂ and H₂O molecules in condensed phases. It should be understood that the hypothetical compound 'sulfurous acid' does not exist in detectable concentrations even in solutions. In contrast to SO₂, selenium dioxide appears to react completely with water, forming the stable selenous acid both in solution and in the crystalline phase. (Author abstract modified)
APTIC-22686

ROTATIONAL COLLISION OF N₂, O₂, CO, AND CO₂ FROM THERMAL TRANSPARATION MEASUREMENTS.

J. Chem. Phys., 53 (4):1317-1324, Aug. 15, 1970. 21 refs.

A. P. Malinauskas, J. W. Gooch Jr., B. K. Annis, and R. E. Fuson.
Identifiers: *Rotational collision, *Thermal transpiration, Mathematical modeling, Nitrogen, Carbon dioxide, Carbon monoxide, Oxygen.

Molecular collisions involving an energy interchange among translational and internal degrees of freedom are known to significantly influence the ability of a gas to conduct heat. Thermal conductivity measurements are investigated as a means of defining these inelastic collision processes. A mathematical description of the thermal transpiration phenomenon is derived, and experimental measurements are made. Results determined at an assumed characteristic temperature of 504 K are reported for all of the noble gases and for nitrogen, carbon monoxide, and carbon dioxide. The helium data are found to be anomalous when viewed in terms of the dusty-gas model for thermal transpiration. Application of the model in the zeroth differential approximation yields the following rotational collision numbers for the polyatomic molecules: N₂, 6.0; O₂, 2.2; CO, 1.3; CO₂, 1.9. (Author abstract modified)
APTIC-22819

ORGANIC SYNTHESIS BY MEANS OF METAL COMPLEXES. V. REACTIONS OF OLEFINS, CARBON TETRACHLORIDE, AND CARBON MONOXIDE CATALYZED BY METAL CARBONYLS.

J. Org. Chem., 35 (9):2982-2986, Sept. 1970. 10 refs.

Tosaku Susuki, and Jiro Tsuji.
Identifiers: *Carbonyls, *Carbon tetrachloride, *Olefins, *Carbon monoxide, Japan, Cobalt compounds, Iron compounds, Molybdenum compounds, Catalytic activity, Chemical reactions, Reaction mechanisms.

Metal carbonyls catalyze various reactions of olefins, among which carbonylations are the most important. Dicobalt octacarbonyl, cyclopentadienyliron dicarbonyl dimer, and cyclopentadienylmolybdenum tricarbonyl dimer are effective catalysts for the addition reaction of carbon tetrachloride and carbon monoxide to olefins to form 2-alkyl-4,4-trichlorobutyl chloride. These dinuclear metal carbonyls are also active catalysts for the addition of carbon tetrachloride to olefins to form 1,1,1,3-tetrachloroalkane. The mechanism of these dinuclear metal carbonyl catalyzed reactions is discussed. (Author abstract modified)
APTIC-22820

CATALYTIC CONVERSION OF HYDROGEN SULPHIDE INTO CARBON DISULPHIDE BY REACTION WITH CARBON TETRACHLORIDE VAPOUR.

Chem. Ind. (London), no. 30:991, July 25, 1970. 6 refs.

M. H. Khundkar, and Moavinul Islam.
Identifiers: *Carbon disulfide, *Hydrogen sulfide, *Carbon tetrachloride, Asbestos, Asia, Chlorides, Catalysts, Reaction kinetics.

A mixture of carbon tetrachloride vapor and hydrogen sulfide was introduced into a silica reaction tube heated in an electric tube furnace having provision for control and measurement of temperature. Reaction products were hydrogen chloride, carbon disulfide, unconverted hydrogen sulfide, and sometimes elementary sulfur. These were absorbed in a 15% alcoholic potassium hydroxide solution. Separation of the sulfide sulfur from the xanthate was achieved by treating the alcoholic potassium hydroxide with ammoniacal zinc chloride solution, which precipitated sulfide as zinc sulfide leaving the xanthate in solution. The xanthate was analyzed by an iodimetric method to determine the carbon disulfide. In the presence of an asbestos catalyst the reaction forming carbon disulfide proceeds well (71.5%) and only 12% of hydrogen sulfide is converted into sulfur.
APTIC-22823

THE ADSORPTION OF NITRIC OXIDE ON IRON OXIDES.

For primary bibliographic entry see Field 02.
APTIC-22828

SURFACE REACTIVITY OF SUPPORTED GOLD. I. OXYGEN TRANSFER BETWEEN CO AND CO₂.

J. Catalysis, 18 (2):200-211, Aug. 1970. 8 refs.
D. Y. Cha, and G. Parravano.

Identifiers: *Gold surface, *Catalytic oxidation, *Surface properties, Metals, Particle size, Catalytic oxidation, Magnesium compounds, Carbon dioxide, Carbon monoxide, Oxygen, Catalytic activity, Decomposition, Reduction, Reaction kinetics, Pressure, Temperature.

The rate of redistribution of isotopic carbon between carbon monoxide and carbon dioxide was studied on gold supported on magnesium oxide in the temperature range 300 to 400°C, pressure ratios 0.1 to 1.2 and total pressure of 50 Torr. A few experiments were also carried out on supported ruthenium and platinum. The effect of Au concentration, temperature, and catalyst preparation method are selected for investigation. In addition, determinations of the particle size of Au were carried out by X-ray to illustrate the effect of the temperature of reduction and decomposition of the Au salt upon the particle size of the metal in the supported catalyst. Chemical reduction of the Au salt at low temperature produced Au particles with diameters less than 150 Å, while particles with diameters 20 times larger were obtained by thermal decomposition of the Au salt. Since particle growth may occur by direct addition of the decomposing salt and/or by sintering among metal particles, it is suggested that the latter process cannot readily occur at temperatures less than 0.3 Tm. The implications of these findings for separate control of the degree of dispersion and of the support coverage by the metal are pointed out. Kinetic observations were employed to study the thermodynamic and kinetic factors contributing to the activity of Au surfaces in the oxygen transfer step between gas and surface phases. Au activity was found to decrease with increasing pressure ratio, indicating that reduced surface species (metal atoms) play a dominant role in the activity of the surface. A similar trend was found for ruthenium and platinum at low pressure ratios. For Pt at higher pressure ratios, a reactivity inversion was found. Under similar conditions of gas composition, temperature and support, the affinity of the Au surface for oxygen increased with decreasing particle size. The degree of dispersion of Au was found to influence the rate of the catalytic reaction. The effect was interpreted in terms of a relation between metal particle size and gas mean free path. The usefulness of these studies for developing criteria for control of oxidation depth and selectivity behavior in catalytic oxidations through optimization of size, size distribution of metal particles, and their morphological connection with the supporting agent is emphasized. (Author abstract modified)

APTIC-22831

VAPOR PHASE SORPTION OF PHENOL ON SELECTED CLAYS.

J. Colloid Interface Sci. 33 (4):539-547, Aug. 1970. 12 refs. (Presented at the American Chemical Society, 158th National Meeting, New York, Sept. 8-12, 1969.)

Ming-Dean Luh, and Robert A. Baker.

Identifiers: *Clay, *Adsorption, *Phenols, Sodium compounds, Vapors, Temperature.

Phenolic-clay complexes may affect plant growth when present in soils and may induce sensory quality impairment when present in water. The isotherms for vapor phase sorption of phenol on sodium kaolinite and sodium montmorillonite were determined over the temperature range 30 to 60°C. Sorbates were purified by serial extraction with diethyl ether and treatment with 30% solution of hydrogen peroxide and were then converted to the sodium form. Total cation-exchange capacities were calculated to be 16.6 and 115.1 meq/100 gm of clay, respectively. Sorption was slow, requiring hours to days to achieve equilibrium. Isotherms were of Type II and exhibited hysteresis and irreversibility on desorption. The amounts of phenol required for monolayer deposition were calculated

to be 6.6 mg/gm and 24.2 mg/gm, respectively. Electrostatic forces and possibly valency forces are postulated to dominate the sorption process during monolayer coverage. Dispersion forces dominate successive coverage. (Author abstract modified)

APTIC-22841

THE SPECTRA OF SOLID SO₂ IN THE 3B1 TRANSITION 1A1 REGION.

J. Mol. Spectr., 35 (3):335-344, Sept. 1970. 14 refs.

Robin M. Hochstrasser, and Alfred P. Marchetti. Identifiers: *Transition states, *Spectrophotometry, *Sulfur dioxide, Absorption, Emissivity, Fluorescence, Electrical properties.

The singlet-triplet transition spectra of sulfur dioxide is studied in solid SO₂ at 4.2 K. The absorption and emission spectra do not coincide. This is interpreted as being caused by self-trapping of the electronic excitation. The vibrational analysis of the absorption and its intensity distribution differ from the gas phase spectra, suggesting that a perturbation between two different electronic states is manifest. The electronic dipole moment in the triplet state is measured. No fluorescence is observed in the solid state, contrary to observations made in gases at high pressure. (Author abstract modified)

APTIC-22851

NATURE AND DISTRIBUTION OF PARTICLES OF VARIOUS SIZES IN FLY ASH.

Army Engineer Waterways Experiment Station, Vicksburg, Miss., TR 6-583, 28p., Nov. 1961. 2 refs.

Wilbur I. Luke.

Identifiers: *Fly ash, *Particle size, Concrete, Analytical methods, Measurement methods, Sieve analysis, Surface properties.

Mechanically precipitated coarse and electrostatically precipitated fine fly ashes were investigated by petrographic, X-ray, chemical, and physical test methods to develop information on the particle size distribution of the coarse and fine fractions of coarse and fine fly ashes, and to determine whether the coarse and fine fractions of a given fly ash differ in characteristics other than particle size. The essential composition of both fly ashes varied significantly with particle size; for example, glass content appeared to increase with decreasing particle size. It was concluded, therefore, that a given size fraction of either fly ash would have essentially similar composition provided the fraction was taken within fairly narrow size limits so that the particle size distributions within the fractions would be essentially similar. As a practical matter, since over any fairly wide size range the within-range size may be expected to be quite different, the compositions may also be expected to differ. The result of these studies suggest that fly ashes are less amenable to separation into size fractions by conventional methods than are most materials of comparable fineness that are of interest in concrete technology. (Author abstract modified)

APTIC-22891

A STUDY OF THE MECHANISMS OF GAS SOLID SUSPENSION HEAT TRANSFER AND FRICTION FACTOR.

Rutgers—The State Univ., New Brunswick, N. J., Dept. of Mechanical and Aerospace Engineering, AEC Contract AT (30-1) 2930, TR-123-MAE-F, 149p., Jan. 1969. 57 refs. CFSTI: NYO-2930-14

Richard L. Peakin, and Richard Briller.

Identifiers: *Friction, *Flow rates, *Heat transfer, Particle size, Transport, Gases, Solids, Reaction mechanisms.

A theory is presented which describes the heat transfer and friction factor changes which occur in a gas solid suspension as compared with pure gas flow. The theory introduces three variables: the particle number density, the laminar sublayer thickness of the boundary layer in pure gas flow,

and a particle penetration depth into the boundary layer. The penetration depth is a measure of the degree of agitation a single particle causes the boundary layer by penetrating it. The theory has four significant advantages over previous correlations. It is mechanistic in nature, which represents a novel approach to this problem. It correlates the data from widely varying experiments onto a single line. The theory demonstrates minimum values below which no increases in heat transfer or friction factor occur for suspensions as compared with similar pure gas flows. The final advantage is that the theory provides physical insight into the boundary layer mechanisms which govern the transport processes. The theory explains such well-known phenomena as the trend toward equality of suspension and pure gas heat transfer at high Reynolds numbers and also the decrease in improvements in heat transfer as particle size increases. Experiments were performed which were included in the data analyzed by the theory. The heat transfer results fell in the range of no suspension enhancement over pure gas flow. The friction factor results showed increases due to the presence of particles. (Author abstract modified)

APTIC-22898

BINARY OXYGEN-NITROGEN COMPOUNDS.

In: Inorganic Chemistry. New York, John Wiley and Sons, 1952, Chapt. 15, p. 591-613. 114 refs. Therald Moeller.

Identifiers: *Nitrogen oxides, *Chemical bonds, *Chemical reactions, Nitric anhydride (N₂O₅), Nitric oxide (NO), Nitrogen dioxide (NO₂), Nitrogen trioxide (NO₃), Nitrous anhydride (N₂O₃), Nitrous oxide (N₂O).

Various oxides of nitrogen are discussed, including nitrous oxide, nitric oxide, nitrosyls, nitrogen sesquioxide, nitrogen dioxide, dinitrogen tetroxide, dinitrogen pentoxide, nitronium compounds, nitrogen trioxide, and dinitrogen hexoxide. The chemical bonding arrangement of the various oxides is discussed, as well as their chemical properties and sources. Technically, only the compounds N₂O, NO, and NO₂ are of any particular importance. Physical constants for the oxides are tabulated. Nitrosyl compounds contain the NO group and are derivable from nitric oxide. Many chemical reactions involving oxides of nitrogen are mentioned.

APTIC-22917

MECHANISM OF THE REACTION BETWEEN HYDROGEN SULFIDE AND SULFUR DIOXIDE IN LIQUID MEDIA.

J. Am. Chem. Soc., vol. 65:1690-1691, Sept. 1943. 8 refs.

Noel F. Albertson, and James P. McReynolds.

Identifiers: *Sulfur dioxide, *Hydrogen sulfide, *Chemical reactions, *Liquids, Catalysts, Reaction mechanisms.

It has been known for some time that sulfur dioxide and hydrogen sulfide will not react with each other in either the gas or liquid phase unless an appropriate third substance is present. The reaction between the two gases to give sulfur and water progresses rapidly in a number of liquid media, but does not take place at all in the presence of others. In the present investigation, the study of the reaction was extended to include liquids not previously reported in the literature. The method used was to bubble a mixture of hydrogen sulfide and sulfur dioxide through the liquid to be examined. Before mixing, both gases were dried over phosphorous pentoxide. Approximately 10 mg per min of each gas was used. The liquids were dried with appropriate reagents to assure absence of moisture. Those liquids which were shown in the present and previous study to bring about the reaction between hydrogen sulfide and sulfur dioxide are listed, as are those that do not catalyze the reaction. The mechanism of the reaction is shown to be (a) the formation of compounds between the hydrogen sulfide and the liquid medium through a hydrogen bridge, (b) the release of hydrosulfide ions by the

additional compounds, and (c) reaction between the sulfur dioxide or its addition compounds with the hydrosulfide ion.
APTIC-22935

THE CHEMICAL BEHAVIOUR OF SULPHUR COMPOUNDS. PART II. KINETICS OF THE GASEOUS REACTION BETWEEN HYDROGEN SULPHIDE AND SULPHUR DIOXIDE.
Proc. Indian Acad. Sci. Sect. A, vol. 34:283-298, 1951. 38 refs.

A. R. Vasudeva Murthy, and B. Sanjiva Rao.
Identifiers: *Sulfur dioxide, *Hydrogen sulfide, *Reaction kinetics, Asia, Cobalt compounds, Molybdenum compounds, Silver compounds, Catalysis, Catalysts, Chemical reactions, Water, Reaction mechanisms.

The kinetics of the reaction between hydrogen sulfide and sulfur dioxide were investigated in an all glass apparatus in which the vapor pressure of water was controlled with the aid of an appropriate hygrostat (a mixture of a hydrated salt and its anhydrous form). Catalysts used were silver sulfide, cobalt thiomolybdate, cobalt sulfide, and molybdenum sulfide. The rates of the reaction, which are summarized in tabular form, were calculated from pressure readings. The results show that certain metallic sulfides can catalyze the union of hydrogen sulfide and sulfur dioxide but only if the sulfides are first activated by moisture. The higher the partial pressure of water, the greater the velocity of reaction. Of the sulfides employed, cobalt thiomolybdate was the best catalyst. Cobalt and molybdenum sulfide were less efficient. Silver sulfide had the least catalytic activity and was not activated by boron trifluoride or aluminum chloride. The mechanism suggested for the reaction between hydrogen sulfide and sulfur dioxide is based on the formation of thiosulfurous acid as the primary product of the reaction. The reaction is reversible. However, under suitable conditions, the thiosulfurous acid can undergo decomposition along other lines instead of reverting to hydrogen sulfide and sulfur dioxide.
APTIC-22946

SOLUBILITY EQUILIBRIUM OF GASEOUS SO₂ IN WATER AT 10-35 C.

(Ravnovesiye pro rastvorenii gazoobraznoy SO₂ v vode pri temperaturakh 10-35 C). Text in Russian. Zh. Prikl. Khim., 41 (5):1131-1133, 1968. 18 refs.

G. P. Arkhipova, K. P. Mishchenko, and I. Ye. Flis.

Identifiers: *Sulfur dioxide, *Water, *Solubility, Usar, Chemical reactions, Reaction kinetics, Temperature.

Available data are used to calculate the concentration of gaseous sulfur dioxide at the moment of equilibrium at various temperatures, and the concentration of SO₂ in water solutions. Results obtained confirm the validity of Henry's law over the range 10-35 C. Reaction equations and rates are calculated.
APTIC-22954

THE EFFECT OF ELECTRIC CHARGES UPON COLLISIONS BETWEEN EQUAL-SIZE WATER DROPS IN AIR.

Quart. J. Roy. Meteorol. Soc. (London), 91 (389):353-355, July 1965. 2 refs.

J. D. Woods.

Identifiers: *Droplets, *Electric charge, Great Britain. Particle size, Photographic methods, Particle growth.

Streak photographs of collisions between equal-size drops carrying electric charges of opposite sign show a marked attraction immediately before coalescence occurs. A steady potential gave charges of the same sign and magnitude to each of the drops; an alternating, square-wave signal with frequency half that of the drop-production rate gave charges of equal magnitude, but opposite

sign, to successive drops. The magnitude of the drop charges for a given drop size and steady potential was determined by directing the drops into a Faraday cylinder connected to a Vibron electrometer. A double beam cathode-ray oscilloscope was used to synchronize the alternating drop-charging signal to half the drop-production frequency. The whole experiment, photographed at 64 frames/sec with a Bolex 16 mm camera, was completed in about two minutes, during which time the drop size remained constant. For drops of radius R less than 40 micron, the coalescence rate increases linearly with drop charge once a threshold value of about 5 times 0.00001 esu has been reached; below this threshold there is no effect. For drops of R greater than 40 micron, which coalesce spontaneously by wake attraction, even when uncharged, the coalescence rate increases linearly with drop charge. Charges of the same sign inhibit coalescence entirely for drops of R less than 40 micron, and reduce the coalescence rate by a factor of five for drops of radius R equal to 40 micron. (Author abstract modified)
APTIC-22960

MICROWAVE SPECTRUM OF THE SO RADICAL IN THE FIRST ELECTRONICALLY EXCITED STATE, 1-DELTA.

J. Chem. Phys., 53 (6):2544-2545, 1970. 19 refs.

Shuji Saito.

Identifiers: *Sulfur oxides, *Rotational transition, *Microwave spectroscopy, Japan, Spectrophotometry.

The first observation of the rotational transition for a molecule in an electronically excited state, i.e., the J equal to 3-2 transition of the sulfur oxide radical in the 1-delta state, is reported. Equipment comprised a spectrometer, an OKI KA128 klystron as the microwave source, and a FXR 2224S crystal as the detector. The SO radical in the 1-delta state was produced by mixing carbonyl sulfide with the products of microwave discharge in molecular oxygen. A single line with signal-to-noise ratio of 10 was found at 127770.47 plus or minus 0.15 MHz, and the observations are cited which form the basis of assigning this line to the J equal to 3-2 transition. The best signal-to-noise ratio of about 50 was obtained when the partial pressures of carbon oxydisulfide and oxygen were 0.085 mm Hg and 0.7 mm Hg, respectively. The rotational constant for the SO radical in the 1-delta state is determined to be 21295.1 plus or minus 0.7 MHz and the bond length to be 1.49198 plus or minus 0.00002 A. Stark effect for the J equal to 3-2 transition is of the first-order because of the lambda-degeneracy and no magnetic hyperfine interaction. Measurements of Stark effect were made on four components of the J equal to 3-2 transition in the electric fields higher than 50 V/cm. The dipole moment for the SO radical in the 1-delta state obtained is 1.336 plus or minus 0.045 D where the uncertainty represents three times the standard error.
APTIC-22974

A CARBON MONOXIDE INSERTION REACTION ON AN EVAPORATED IRON SURFACE.
Chem. Commun., no. 17:1122-1123, 1970. 11 refs.

A. J. Goodsel, and G. Blyholder.

Identifiers: *Complexes, *Iron compounds, *Carbon monoxide, Adsorption, Infrared spectrometry, Ethylene, Chemical reactions.

As determined by infrared spectroscopy, heating a sample of evaporated iron containing chemisorbed ethylene and chemisorbed carbon monoxide in an evacuated cell for 6 hr at 100 deg produced a species on the surface with broad bands at 950 and 1100 reciprocal cm. Comparison of the final chemisorbed species to other known spectra of chemisorbed compounds indicated that the product of the reaction between carbon monoxide and ethylene is probably a propoxide species. The reaction is analogous to the carbon 'insert' reaction in coordination complexes, but two significant differences exist. First, the reaction on the iron

surface proceeds under milder conditions. Secondly, an acyl structure is found for the final product of insertion reactions on transition-metal complexes, while an alkoxide species prevails on the iron surface.
APTIC-22978

THE CHEMISORPTION OF CARBON MONOXIDE AND NITROGEN ON THIN NICKEL FILMS.

Ber. Bunsenges. Physik. Chem., 74 (7):630-636, 1970. 21 refs.

A. M. Bradshaw, and O. Vierende.

Identifiers: *Infrared spectrometry, *Nickel compounds, *Nitrogen, *Carbon monoxide, Germany, Adsorption.

The chemisorption of carbon monoxide and nitrogen on thin nickel films at low temperatures was studied by means of infrared transmission techniques combined with measurements of conductivity changes. Growth of absorption bands during carbon monoxide adsorption was complete before full coverage was reached. Certain features of the spectra for the CO/Ni system differed from earlier results. For example, the high frequency band affected by the anomalous transmission effect occurred at 2090 reciprocal cm instead of 2070 reciprocal cm. In addition, films deposited at 153 K and 173 K still gave absorption to below 1700 reciprocal cm. An important result was the virtual loss of the 2090 reciprocal cm band on warming. The intensity of this band at lower temperatures appears to be linked to the deposition temperatures and thus to the structure of the film. The spectra reported for the N₂/Ni system are in good agreement with earlier work. A maximum occurred at 2255 reciprocal cm together with shoulders at 2230 and 2180 reciprocal cm. Band growth was complete after an exposure of 250 L. While the dependence of the 2090 reciprocal cm band supports an earlier conclusion that CO molecules are adsorbed on loosely packed planes or at edge and corner sites, the authors conclude that they cannot yet assign absorption bands to adsorption on particular sites or planes.
APTIC-22980

ON THE FILTRATION OF AEROSOL.

(Rokashujin ni tsuite). Text in Japanese. Kuki

Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 8 (3):33-42, Aug. 1, 1970. 16 refs.

H. Eml.

Identifiers: *Mathematical modeling, *Aerosols, *Filters, Japan, Particle size, Diffusion, Electric charge.

Basic studies on the aerosol capturing capacity of fiber packed filters were conducted to give direction to filter design on thickness, compactness, or fiber diameter. Two kinds of models were proposed for the particle capturing process: a single cylinder of small compactness and an orifice of large compactness. The principal mechanisms of capturing aerosol particles of micron order are inertia, diffusion, and blocking. When the particles or fibers are charged, electrostatic forces come into consideration. Gravity is normally neglected. After giving the definition of the capturing efficiency of a single fiber and also that of a filter, the theory of capturing aerosol particles by a single, clean fiber is explained. The basic equation of motion of a particle approaching a cylindrical fiber is described, together with numerical solutions by an electronic computer. The estimate of capturing efficiency by mechanical and electrostatic filtration is given. The solution is valid for the fiber filter of packed-layer type, which has a void-space ratio of over 90% and is placed at a right angle with the flow direction. Some selection criteria for the fiber are listed. The blocking parameter, that is, the ratio of aerosol and fiber diameters, should be chosen between 0.1 and 0.5. For aerosols larger than 1 micron the recommended filtration should be in the inertia-dominating region. For those which have the diameter less than 1 micron on the other hand, the diffusion-dominating region

should be used. The basic approach is concluded to be important in the filter design for preventing air pollution.
APTIC-22992

EXPERIMENTAL STUDIES ON ROTARY DUST COLLECTORS-EFFECT ON TANGENTIAL AND AXIAL INLETS ON PERFORMANCE.
For primary bibliographic entry see Field 02.
APTIC-22993

ADSORPTION OF MULTICOMPONENT MIXTURES BY SOLID ADSORBENTS.
Am. Inst. Chem. Engrs. J., 16 (5):718-724, Sept. 1970. 22 refs.
Agustin J. Gonzalez, and C. D. Holland.
Identifiers: *Mathematical modeling, *Solids, *Adsorption, Reaction kinetics, Thermodynamics.

The increased use of solid adsorbents in separation processes has led to the need for methods for predicting the equilibria of multicomponent mixtures from a knowledge of the equilibrium adsorptions for pure components. A procedure based on kinetic principles is presented for the development of models for the adsorption of mixtures of gases in any number of layers by solid adsorbents. Equations of state for two-dimensional gas mixtures which are thermodynamically consistent with the adsorption models are also presented. The constants in the adsorption models for mixtures are obtained from the isotherms for the pure components. Good accuracy for the predicted adsorption of mixtures for the data available was obtained by use of a model for the adsorption of mixtures in bimolecular layers.
APTIC-22994

THEORETICAL STUDY OF THE ELECTRONIC STRUCTURE OF SULFUR DIOXIDE.
Trans. Faraday Soc., 66 (571):1544-1547, July 1970. 11 refs.
I. H. Hillier, and V. R. Saunders.
Identifiers: *Sulfur dioxide, *Slater type orbitals (sto), *Gaussian type functions (gtf), Great Britain, Computers, Mathematical analyses, Carbon disulfide, Hydrogen sulfide, Electrical properties.

Self-consistent field molecular orbital calculations are described for sulfur dioxide using Slater type orbitals expanded in Gaussian functions. Both a minimal basis and one expanded by adding 3d orbitals on the sulfur atom were used. The appreciable decrease in the calculated molecular energy on expansion of the basis set suggests that a much improved wave function is obtained on inclusion of 3d orbitals. This is indeed shown by the good agreement of the results of such a calculation with the photoelectron spectrum and bond angle, and the failure of the results of a minimal basis calculation to correlate with these experimental data. The molecular dipole moment found by all the calculations is in reasonable agreement with the experimental value. However, the agreement shown by the minimal basis set calculations may be fortuitous; as the molecules hydrogen sulfide and carbon sulfide, satisfactory calculation of the dipole moment requires the use of an extended basis. The calculations reported here took approximately 80 min on the Atlas Computer for each molecular geometry.
APTIC-22999

INVESTIGATION OF THE TEMPERATURE DEPENDENCE OF CORONENE PHOSPHORESCENCE IN N-PARAFFINS.
(Issledovaniye temperaturnoy zavisimosti fosforesentsii koronena v n-parafinakh). Text in Russian. Opt. i Spektroskopiya, 25 (3):368-372, 1968. 4 refs.
D. M. Grebenshchikov.
Identifiers: *Phosphorescence, *Temperature, *Coronene, *Usar, Spectrometry, Aliphatic hydrocarbons, Polynuclear compounds.

The temperature dependence of intensity (I) and mean duration (τ) of coronene phosphorescence in both degassed and oxygen-saturated n-octane and n-dodecane solutions was studied at temperatures up to 260 K in the 5630 Å band. When the solution is frozen, two types of emission centers (designated A and B) are formed which exhibit different sensitivity to oxygen, different temperature dependence of I in the absence of oxygen, and a different τ at 77 K. Type A centers, the phosphorescence of which is quenched by oxygen molecules only at temperatures approaching the melting point of the solvent, predominate in an n-octane solution, i.e., in the case of a quasilinear spectrum. Type B centers, which are quenched by oxygen at a much lower temperature (about 100 K) predominate in the case of a diffuse spectrum (n-dodecane solution).
APTIC-23020

EFFECT OF TEMPERATURE ON THE SPECTRUM OF SULFUR DIOXIDE.
Can. J. Chem., 47 (22):4291-4293, 1969. 6 refs.
CFSTI, DDC: AD 698089
J. Brown, and George Burns.
Identifiers: *Ultraviolet spectrometry, *Sulfur dioxide, *Thermodynamics, Canada, Spectrometry, Temperature.

The effect of temperature on the ultraviolet spectrum of sulfur dioxide was studied over the temperature range 20 to 1000 C. The equilibrium constant for the reversible reaction SO₂ yields (SO₂) where (SO₂) is an isomeric form or an excited state of sulfur dioxide was obtained at several temperatures. The detector used was a quartz spectrograph and exposures were made on spectrographic analysis plates; band intensities were measured on a microphotometer. From the experimental results, the enthalpy change for the transition was 4.1 plus or minus 0.4 kcal/mole. (Author abstract modified)
APTIC-23031

THREE-DIMENSIONAL STUDY OF A JET PENETRATING A STREAM AT RIGHT ANGLES.
J. Aeronaut. Sci., 21 (1):59-61, Jan. 1954. 5 refs.
J. P. Fraser.
Identifiers: *Jet penetration, *Mathematical analyses, *Pressure.

A two-dimensional treatment of the penetration and deflection of jets oblique to a general stream was published early in 1953. A complementary three-dimensional study of a round jet penetrating at right angles is reviewed for comparison. The study sought to determine the relative importance of dynamic pressure forces and mixing to jet penetration. The comparison was accomplished indirectly by analytically calculating the distortion and deflection of the jet due to dynamic pressure forces in the first diameter of travel, extrapolating the deflection curve to permit comparison with an experimental curve of jet penetration, and inferring that jet penetration is chiefly controlled by pressure forces. The conclusion is drawn that pressure forces limit jet penetration by accomplishing the sharp turning after egress followed by a further slow penetration due to turbulent mixing. This physical picture is in keeping with experimental observations that a hole elongated in the stream direction gives better penetration than a circular hole of the same area. Qualitative agreement between results of the analysis and the two-dimensional study is explained in terms of the rapid flattening of a round jet.
APTIC-23056

PYREX MEMBRANE POTENTIAL IN BINARY NITRATE MELTS.
Miami Univ., Coral Gables, Fla., Dept. of Chemistry, Contract Nonr-4008 (07), SR-5, 11p., Sept. 1, 1967. 10 refs. CFSTI, DDC: AD 657447
A. G. Keenan, Karl Notz, and F. L. Wilcox.

Identifiers: *Nitrates, *Voltage, *Pyrex membranes, Mathematical modeling, Lithium compounds, Potassium compounds, Silver compounds, Sodium compounds.

Electromotive force measurements at 350 C are reported for cells with a Pyrex membrane and containing binary nitrate melts of the type M nitrate-silver nitrate, where M is lithium, sodium, or potassium varying in concentration from 0 to 90 mole %. An ion-exchange model fits the data while a liquid-junction model does not. The result agrees with a previous fused salt system involving an inert solvent and a lower concentration range but constitutes a more stringent test of the ion-exchange model since both cations are potential-determining and present over essentially the whole concentration range. Selectivity constants have the same rank order in the two systems as well as in aqueous solutions. The significance of this is discussed. (Author abstract modified)
APTIC-23074

IR SPECTRA OF CARBON MONOXIDE ADSORBED ON GAMMA-AL₂O₃.
Kinetics Catalysis (USSR) (English translation from Russian: Kinetika i Kataliz), 10 (5):914-918, Sept.-Oct. 1969. 13 refs.
Yu. M. Shchekochikhin, and A. A. Davydov.
Identifiers: *Infrared spectrometry, *Aluminum oxides, *Carbon monoxide, *Usar, Adsorption, Formic acid, Hydroxides, Carbon monoxides, Chemical bonds, Ionization, Ions, Temperature.

Adsorption of carbon monoxide on gamma-aluminum oxide and alkali-treated Al₂O₃ was studied by infrared spectroscopy. When the aluminum oxide was heated to 400 C, three adsorption maxima with frequencies of 2360, 2720, and 2760 reciprocal cm were observed. Adsorption of CO at room temperature lead to the appearance of bands at 1343, 1355, 1372, 1544, 1562, and 1581 reciprocal cm. Simultaneously, the maxima at 2720 and 2760 reciprocal cm disappeared and the intensity of the 2630 reciprocal cm band decreased. Adsorption of CO at 20-400 C on aluminum oxide containing surface OH groups resulted in three maxima in the 1300-1400 reciprocal cm range and three in the 1500-1700 reciprocal cm range. These maxima (1355, 1361, 1380, 1590, 1627, and 1659 reciprocal cm) appear to be associated with the formation of surface formate ions having different degrees of ionization. Presumably, the difference in the degree of ionization of the surface ions is related to the nature of COO bonds as affected by octahedra, tetrahedra, and cationic defects in gamma-Al₂O₃.
APTIC-23110

INFRARED REFLECTANCE SPECTRA OF CARBON MONOXIDE ADSORBED ON NICKEL AND RHODIUM (110) SURFACES IN HIGH AND ULTRAHIGH VACUA.
J. Chem. Phys., 52 (10):3435-3441, May 15, 1970. 17 refs.
Hartley Eckstrom, Glen G. Posaley, Steven E. Hannum, and William Hayden Smith.
Identifiers: *Infrared spectrometry, *Nickel compounds, *Carbon monoxide, *Adsorption, Absorption.

Vibrational spectra of carbon monoxide adsorbed on clean, oriented, annealed, single-crystal metal face were obtained via infrared spectroscopy and under reproducible and readily interpretable conditions. The observations covered the region from 4000-50 reciprocal cm. A narrow band due to physically adsorbed or weakly chemisorbed CO on Nickel was found at 2056 reciprocal cm, with a full width at half-maximum (fwhm) of about 10 reciprocal cm and a reflection maximum at 2038 reciprocal cm. The corresponding isotopic (¹³C) CO absorption was located at 1998 reciprocal cm. These absorptions could not be observed with certainty for pressures of CO below 0.5 torr. At lower pressures, reflectance changes indicated the presence of CO, but definite absorptions were not

identified because of lower signal-to-noise ratio and background variations. The fundamental of chemisorbed CO on rhodium was observed as a doublet at 2078 and 2060 reciprocal cm (fwhm, 10 reciprocal cm for each component) with a reflection maximum at 2030 reciprocal cm. A further weak absorption attributed to adsorbed CO was found at 1988 reciprocal cm on rearranged films. The bands remained undiminished upon evacuation at room temperature. These and other observations of the systems are discussed and compared with results found in the literature. (Author abstract modified)
APTIC-23112

ADSORPTION OF AEROSOL OT AT THE SOLID-LIQUID INTERFACE.

Kolloid Z. u. Z. Polym., 239 (1):602-605, July 1970. 19 refs.

F. A. Saleeb.

Identifiers: *Aerosols, *Adsorption, *Surfactants, Africa, Liquids, Solids, Reaction mechanisms, Surface properties.

Adsorption of aerosol OT from aqueous solution on to six adsorbents of known specific surface area but of varying surface properties was measured. Aerosol OT (sodium di-2-ethylhexylsulfosuccinate) was chosen as the surfactant because it is relatively stable against hydrolysis, can be readily obtained in a pure state, and the sulfonic group is insensitive to pH. For the polar surfaces, adsorption corresponding to a double layer occurred. The first layer is adsorbed with the surfactant polar heads directed to polar sites on the surface, while the second layer is held by inter-chain cohesion. With the non-polar carbon surface of Sterling MT, adsorption is physical and reaches a completely packed monolayer. A maximum in the adsorption was found only for the adsorption of aerosol from water on to calcium phosphate and carbonized coal. (Author summary modified)
APTIC-23122

RADIATIVE LIFETIME OF NITROGEN DIOXIDE USING A TUNABLE ORGANIC DYE LASER.

Chem. Phys. Letters (Amsterdam), 6 (4):323-325, Aug. 15, 1970. 11 refs.

Philip B. Sackett, and James T. Yardley.

Identifiers: *Lasers, *Nitrogen dioxide (no2), *Radiative decay, Fluorescence.

Direct time-resolved measurements were made of the radiative lifetime of electronically-excited nitrogen dioxide molecules as a function of exciting wavelengths from 4400 Å to 4900 Å. A tunable organic dye laser was used to excite the molecules, and approximately five percent of the laser intensity was directed to a spectrograph for precise determination of the excitation wavelength; the remainder of the beam entered a spherical fluorescence cell. The fluorescence was detected with a photomultiplier tube. Radiative lifetimes of the molecules increased from approximately 72 micronsec at 4400 Å to approximately 80 micronsec at 4900 Å. The variations of measured lifetime with observation region give clear evidence that molecular states of different lifetimes are excited by a single laser pulse.
APTIC-23137

FLUORESCENCE OF NITRIC OXIDE. PART 6. PREDISSOCIATION AND CASCADE QUENCHING IN NO D SQUARED SIGMA + (V EQUALS 0) AND NO C SQUARED PI (V EQUALS 0), AND THE OSCILLATOR STRENGTHS OF THE EPSILON AND DELTA (O,O) BANDS.

Trans. Faraday Soc., 66 (B-572):1886-1906, Aug. 1970. 23 refs.

A. B. Callear, and M. J. Pilling.

Identifiers: *Quenching, *Nitric oxide (no), *Dissociation, Great Britain, Nitrogen, Carbon dioxide, Fluorescence.

Experiments are described which are designed to investigate the possible occurrence of spontaneous predissociation of nitric oxide in the D squared sigma + (v equals 0) state, and to determine its fate in collision. Argon induces the transition of nitric oxide from the D squared sigma + (v equals 0) state to the C squared pi (v equals 0) state with unit efficiency. Nitrogen, carbon dioxide, and nitric oxide do not induce the cascade transition. The rate of spontaneous predissociation is small compared to the rate of spontaneous emission. The characterization of the argon-induced transition from the D to C state is complicated because the delta-bands simultaneously undergo a partial quenching which masks the enhancement due to the cascade transition. The two effects are separated by restricting the population of the D state with filtered light. With high inert gas pressures (rotational equilibrium), NO in the C state predissociates 33 plus or minus 5 times more rapidly than it radiates to the ground electronic state. The oscillator strengths of the epsilon (O,O) and delta (O,O) bands are measured by two methods. (Author abstract modified)
APTIC-23141

THE RATIONALIZATION OF THE VENTILATION ARRANGEMENT.

(Kanki setsubi no gorika). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 8 (3):1-16, Aug. 1, 1970. 18 refs.

Taro Hayashi.

Identifiers: *Mathematical analyses, *Ventilation, Japan, Dusts, Air conditioning equipment, Exhaust systems, Absorption, Instrumentation, Fluid flow, Pressure, Temperature.

Ventilation is discussed as mechanical transportation of air for the use of living and non-living entities as well as unwanted air. Ventilation can be categorized into four types: localized exhaust, localized ventilation, total ventilation, and isolation. An attempt is made to systematically relate each of the categories. Engineering techniques involved in the mechanics of ventilation consist of natural and mechanical draught, two-dimensional as well as three-dimensional flow, push- and pull-flows, and the direction of flow of clean and dirty air. The tangible and intangible elements involved in ventilation facilities are: push, pull or both in series; localized, total and isolating; vertical, horizontal, oblique and winding; temperature, specific weight, pressure, diffusion and humidity of the fluid; odor and toxicity; acceleration and noise of the fluid; laminar flow and turbulence; the position and the effects of animate and inanimate objects; and productivity, safety, comfort, economy and endurance. Taking all the above factors into consideration, the planning of ventilation was conducted based on the 'flow ratio' method. Mathematical formulations of such items as two-dimensional flow - sideways suction hoods, three-dimensional flow - sideways suction hoods, etc. are presented in detail by means of diagrams, graphs, tables and photographs. Various actual planning designs are introduced and analyzed.
APTIC-23153

VIBRATIONAL RELAXATION MEASUREMENTS OF CARBON MONOXIDE IN A SHOCK-TUBE EXPANSION WAVE.

J. Chem. Phys., 53 (7):2850-2857, Oct. 1970. 17 refs.

T. Ian McLaren, and John P. Appleton.

Identifiers: *Carbon monoxide, *Translation-vibration energy transfer, *Shock-tube expansion wave, Chemical reactions, Cooling, Infrared radiation, Gases, Electrical properties.

A novel technique is developed for use in the study of collisional energy transfer and chemical reaction rates in rapidly cooled gases. The principal feature is that the shock heated test gas sample is stationary during the cooling process so that the temporal behavior of a particular nonequilibrium property may be continuously monitored. The technique is applied to the measurement of the

vibrational de-excitation rate of carbon monoxide in an argon heat bath, using the fundamental infrared emission band of CO to follow its vibrational temperature throughout the expansion. In contrast to some recent investigations which indicate enhanced vibrational de-excitation rates, the present experiments show that when transition-vibration collisions control the relaxation process the characteristic vibrational relaxation time of carbon monoxide diluted in argon is the same no matter whether it is measured in a compression (shock wave) or expansion environment. (Author abstract modified)
APTIC-23158

PHOTOCATALYTIC AND THERMAL CATALYTIC DECOMPOSITION OF NITROUS OXIDE ON ZINC OXIDE.

Chem. Commun., vol. 18:1130-1131, 1970. 3 refs.

Ken-Ichi Tanaka, and George Blyholder.

Identifiers: *Zinc compounds, *Nitrous oxide (n2o), *Catalysis, *Decomposition, Oxides, Reaction kinetics, Reaction mechanisms.

The catalytic decomposition of nitrous oxide on zinc oxide, pretreated with nitrous oxide, was carried out under illumination and at 371-431 deg. Thermal catalytic and photocatalytic reactions occur simultaneously on zinc oxide under illumination but obey completely different kinetics. The thermal reaction is first order and independent of oxygen pressure, while the photocatalytic reaction depends on oxygen pressure. Since the reaction is inhibited by the electron scavengers N2O and O2, the photocatalytic process may proceed via electron transfer to form an ionic species at the surface. Thermal catalytic decomposition does not pass through the same intermediates as in the photocatalytic process, so electron transfer may not be involved in the thermal reaction.
APTIC-23159

ELECTRON SPIN RESONANCE STUDIES OF IRRADIATED NITROUS OXIDE.

Can. J. Chem., 48 (2):1803-1811, June 15, 1970. 36 refs.

D. R. Smith, and W. A. Seddon.

Identifiers: *Nitrous oxide (n2o), Canada, Spectrometry, Nitrogen, Nitrogen dioxide (no2), Nitrogen trioxide (no3), Free radicals, Water, Reaction mechanisms.

Electron spin resonance techniques were used to investigate the paramagnetic species produced directly by gamma-radiolysis of nitrous oxide at 77 K or by vapor phase irradiation with 1 MeV He (+) ions followed by condensation at 77 K. The four paramagnetic species obtained from labelled N2O were identified as N2O (+), NO2, NO3, and N. The latter assignment is reasonable on spectroscopic grounds, but formation of the species from established chemical reactions is difficult to describe, since it arises exclusively from the central nitrogen of N2O. The addition of H2O to the vapor phase experiments resulted in the trapping of O (-), while the addition of tetranitromethane or nitric oxide indicated the existence of O2 (-) and O atoms, respectively. Possible reaction mechanisms are indicated. (Author abstract modified)
APTIC-23165

THE ACTION OF SULPHUR DIOXIDE UPON OILS AND THEIR FATTY ACIDS.

J. Soc. Chem. Ind., 51 (7):317-319, April 15, 1912.

S. A. Hird, and L. L. Lloyd.

Identifiers: *Sulfur dioxide, *Chemical reactions, *Fatty acids, *Essential oils, Odors, Sulfuric acid, Catalysis, Oxidation, Polymerization.

A number of oils, and independently the fatty acids obtained from the oils, were subjected to the action of sulfur dioxide under different conditions; in most cases, the physical and chemical properties were found to alter. Generally, the iodine value was reduced, the saturation number increased, and the melting point and solubility were

affected. Production of a dark color and the polymerization of most of the oils or fatty acids appeared to be governed by the iodine value, because the higher the iodine value, the more rapid was the darkening and thickening of the oils or fatty acids. Yet, this view was not supported by the results of the action of SO₂ upon castor oil when treated in the cold, or to a greater extent upon practically pure oleic acid. The darker color obtained with the oils or fatty acids by means of oxygen and SO₂ is no doubt due to the oxidizable oils acting as catalytic agents in the transfer of oxygen from the air to the SO₂, the production of sulfuric acid being consequently cumulative. Quicker drying oils give color reactions most readily, while their amount of sulfuric acid is higher. On treatment with sulfur dioxide, especially in the presence of air, the oils develop an unpleasant odor, whereas the fatty acids are scarcely altered in odor. The reactions which result when oils and fatty acids are subjected to SO₂ are presented tabularly.

APTIC-23187

A STUDY OF THE FACTORS INFLUENCING COMPOUND FORMATION AND SOLUBILITY IN FUSED SALT MIXTURES.

J. Am. Chem. Soc., vol. 45:963-998, April 1923. 60 refs. (Presented at the American Chemical Society, Pittsburgh Meeting, Sept. 6, 1922.) James Kendall, E. D. Crittenden, and H. K. Miller. Identifiers: *Solubility, *Fused salt mixtures, Bromides, Chlorides, Aluminum compounds, Antimony compounds, Chemical reactions, Electrolysis, Thermodynamics, Electrical properties, Pressure, Temperature.

Freezing-point curves of more than 50 binary fused-salt mixtures were investigated; factors affecting compound formation and solubility were critically examined for aluminum bromide with other bromides, aluminum chloride with other chlorides, and antimony trichloride with other chlorides. Other factors which were considered include valence, unsaturation, position in the electrode-potential series, temperature, internal pressure, atomic volume, atomic number, and association. Due to the extremely hygroscopic nature of the reference substances selected, it was necessary to carry out all freezing-point determinations in sealed bulbs. In the 25 aluminum bromide systems examined, 34 compounds were established; in the aluminum chloride series, 16 systems were studied and 19 compounds isolated; and 5 compounds were gained from the 12 antimony trichloride series investigated. The common occurrence of immiscibility in the liquid state is to be ascribed to the extreme internal pressure difference existent in many systems between the 2 components. As in previous work, the diversity of the constituent radicals of the component substances is the main influence on compound formation and solubility. Whenever two systems are compared of the types, HX:RX and HX:R'X', in which the radicals R and R' have approximately the same electrode potentials but possess different valence, compound formation and solubility are much less extensive in the case of the radical with the higher valence. When the results for two systems in which the same element exhibits different valences are examined, the salt in which the radical is 'unsaturated' shows far greater compound formation than the salt in which the maximum valence is exercised. The rate at which double salt formation decreases in stability, as the reference radical is approached from either side, increases as the electropositive character of this reference radical diminishes. Temperature of fusion of the second component must be taken into account when considering solubility relationships.

APTIC-23192

THE PHYSICS OF SMALL AIR-BORNE IONS. American Inst. of Medical Climatology, Philadelphia, Pa., Proc. Intern. Conf. Ionization Air, Philadelphia, Pa., 1961, 1 (6), 27p. 1 ref. Peter Kraus, and T. A. Rich.

Identifiers: *Ions, Inhalation therapy, Particle counters, Condensation, Nucleation, Electrical properties.

To predict how high an ion level can be achieved in a practical chamber or room, and what precautions must be taken to ensure test results which have the highest possible accuracy, some of the underlying physical principles that govern behavior of air-borne ions, particularly small ions, are presented. Mobility, which is an equilibrium condition in which the acceleration of the electrostatic field is balanced by the retarding action of molecular collision, is a vital factor in ion behavior. A counter is designed to provide sufficient electrostatic force to attract ions of a given mobility from the furthest distance inside the counter, but it also attracts heavier ions that happen to be closer. In most cases, this additional count is negligible compared to the total count of small ions, but in some situations it may be an important factor. If one is working with ion measurements to any significant extent, it is a good idea to familiarize oneself with normal field plotting technique as it may be important in the results one obtains. Not to lose ions before they reach a patient's nose one must remember to ground the subject and avoid synthetic clothing. The problem of uniform mixing is particularly important for space charge losses which vary with the square of ion concentration. Condensation nuclei are also important. The ion level decays rapidly at high ion concentrations where the square function of space charge is the major loss. Test results of ion loss in a continuous duct are presented.

APTIC-23193

A KINETIC THEORY OF DIFFUSELY REFLECTING BROWNIAN PARTICLES.

In: Pacific Northwest Laboratory Annual Report for 1969 to the USAEC Division of Biology and Medicine. Volume II: Physical Sciences. Part I. Atmospheric Sciences. Battelle Northwest, Richland, Wash., Environmental and Life Sciences Div., p. 115-119, June 1970. 11 refs. CFSTI: BNWL-1307, Part I W. G. N. Slinn.

Identifiers: *Diffusion, *Brownian movement, *Particulates, Particle shape, Particle size, Gases.

An analysis is made of the motion of a spherical Brownian particle whose surface can diffusely reflect the molecules of an equilibrium host gas. The analysis is based on Newton's second law and a limiting form of Markoff's method. Equipartition of energy is a consequence of the dynamics and randomness of the motion, both for specular and diffuse reflections. The diffusion coefficient can depend on the temperature of the particle. The entire analysis is restricted to the case for which the Knudsen number of the particle is large compared to unity. (Author abstract modified)

APTIC-23203

TRANSPORT OF AEROSOLS THROUGH DUCTS.

Ind. Eng. Chem., 3 (4): 339-345, Oct. 1964. 4 refs. (Presented at the American Institute of Chemical Engineers Annual Meeting, 47th, Baltimore, Md., May 1962.) R. I. Mitchell, R. E. Thomas, and A. A. Putnam.

Identifiers: *Aerosols, *Aerosol generators, *Transport, Particle size, Mathematical modeling, Diffusion, Aerodynamics, Flow rates.

The efficiency with which aerosols and particulate matter can be transported through ducts without excessive loss of particles is frequently of great interest in studies related to public health and industrial processes. For example, aerosol transport is important in processes involving the handling of dust-laden air or cleaning of air, and in studies of air pollution. Transport efficiency of a dibutyl phthalate aerosol composed of liquid droplets 25 microns in diameter and smaller was determined as a function of particle size when moved through a horizontal duct at air velocities of 8.8, 96, 440, and

880 ft/min. The apparatus consisted essentially of an aerosol-generation chamber containing pneumatic nozzles and spinning-disk atomizers, a duct, and a blower. A concurrent theoretical study was made to mathematically relate the change in particle concentration caused by settling and by turbulent diffusion to the duct wall when an aerosol moves within a duct, to particle size, distance and velocity of movement, physical properties of the material dispersed, of the suspending medium, and the conditions of flow. The results of the experimental work correlated well with a semiempirical mathematical expression that was developed, defining transport efficiency as a function of particle size, air-stream velocity, and duct size. However, a direct use of the dimensionless plot of the experimental results appears to be preferable, when possible. (Author abstract modified)

APTIC-23243

CHEMICAL APPLICATION OF METASTABLE ARGON ATOMS. IV. EXCITATION AND RELAXATION OF TRIPLET STATES OF NITROGEN.

Preprint, Kansas State Univ., Manhattan, Dept. of Chemistry, 42p., 1969. 44 refs.

D. W. Setser, and D. H. Stedman.

Identifiers: *Nitrogen, *Argon, *Transition states, Quenching, Spectrometry, Light radiation, Electrical properties.

An argon flow system containing about 0.01% of metastable argon atoms in the absence of other energy carriers is described and characterized. The reaction of these metastable atoms with nitrogen gives a range of nitrogen radiative transitions. Absolute intensity measurements, high resolution spectra, and pressure dependence data show that the direct production of two excited states of nitrogen takes place. The mechanism for the anomalous rotational intensity alternation in one of the excited states is discussed, and rotational relaxation is shown to take place at a rate, with slower electronic quenching. Similar results are presented for a second excited state. (Author abstract modified)

APTIC-23255

SHAPE OF TURBULENT JET AXIS IN AN UNBOUNDED HORIZONTAL CROSS FLOW.

J. Eng. Phys. (English translation from Russian: Izv. Fiz. Zh.), 9 (4):303-306, Oct. 1965. 7 refs.

A. M. Epshteyn.

Identifiers: *Mathematical analyses, *Jets, Ussr, Atmospheric movements, Turbulence (atmospheric), Density.

A simplified equation is derived for determining the axis of a jet on the curvature of a jet whose density differs from that of the surrounding medium. Calculations according to the equation show good agreement with experimental data of other authors.

APTIC-23306

FLUORESCENCE OF NITRIC OXIDE. PART 7. QUENCHING RATES OF NO C SQUARED PI (V EQUALS O), ITS RATE OF RADIATION TO NO A SQUARED SIGMA PLUS, ENERGY TRANSFER EFFICIENCIES, AND MECHANISMS OF PREDISSOCIATION.

Trans. Faraday Soc., 66 (571):1618-1634, July 1970. 25 refs.

A. B. Callear, and M. J. Pilling.

Identifiers: *Quenching, *Nitric oxide (no), *Fluorescence, *Reaction kinetics, Great Britain, Nitrogen, Carbon dioxide.

The concluding experiments in an ambient temperature study of the fluorescence of nitric oxide are reported. These experiments were required to define the kinetics of both spontaneous and collision induced transitions of NO (D squared sigma plus) (v equals O) and NO (C squared pi) (v equals O). The discussion principally concerns the mechanism of predissociation of NO (C squared

pi) (v equals 0), and it is suggested that NO (a to the fourth power pi) provides the link to the separated atoms. The delta-bands undergo a partial quenching because a few of the states of NO (C squared pi) lie below the dissociation limit, indicating that D sub o (NO) equals 52,400 plus or minus 10 reciprocal cm. The following experimental results are reported: accurate rates of quenching of NO (C squared pi) (v equals 0) by N₂, CO₂, Ar, and NO; measurement of the rate of the NO (C squared pi) (v equals 0) yields NO (A squared sigma plus) cascade radiation (f sub el equals 1.6 plus or minus 0.6); efficiencies of energy transfer in the deactivation of NO (D squared sigma plus) (v equals 0) to N (A squared sigma plus) by N₂; 'anomalous' quenching rates of the delta-bands by N₂, CO₂, and NO; and partial quenching of the 15N16O delta-emission by Ar. A compilation of the quenching parameters is given. APTIC-23324

ADSORPTION OF CARBON MONOXIDE ON COPPER BROMIDE

Kinetics Catalysis (USSR) (English translation from Russian of: *Kinetika i Kataliz*, 10 (5):964-968, Sept.-Oct. 1969, 9 refs.

I. A. Kirovskaya, L. G. Maidanovskaya, and G. D. Murzina.

Identifiers: *Adsorption, *Bromides, *Copper compounds, *Carbon monoxide, Ussr, Control methods, Reaction kinetics, Reaction mechanisms, Temperature.

Adsorption of carbon monoxide on copper bromide was studied in a static vacuum system at -186 to +210 C and 0.097 to 1.50 mm Hg. The adsorption isobars obtained show a minimum at 90 C, indicating the existence of two types of adsorption. From -186 to +90 C, adsorption is evidently molecular. Above 90 C, there appears to be irreversible chemisorption. In molecular adsorption, equilibrium is established after 5-10 min, and the initial state of the surface of the sorbent is easily regenerated. In chemisorption, 40-50 min are required for establishment of equilibrium, and the adsorbed gas leaves the surface with more difficulty. Kinetic curves for adsorption at 90-210 C constitute evidence of a rise in adsorption rate with temperature, i.e., the presence of the chemically activated process. The mean adsorption activation energy, as calculated by the Roginski-Zel'dovich kinetic law, is within 3-6 kcal/mole. Desorption curves are of a sharply exponential nature, indicating that the adsorbed particles leave the points of localization by a single leap rather than by diffusion. It is believed that adsorption of CO on CuBr takes place on copper or bromine atoms, with the formation of carbonyl type surface compounds having a linear structure. APTIC-23332

THERMAL ENERGY REACTIONS OF C (-) WITH O₂, N₂O, CO, AND CO₂

J. Chem. Phys., 53 (7):2614-2615, Oct. 1970, 6 refs. F. C. Fehsenfeld, and E. E. Ferguson.

Identifiers: *Thermal energy reactions, *Carbon dioxide, *Carbon monoxide, *Nitrous oxide (n2o), *Oxygen, Nitrous oxide (n2o), Chemical reactions, Ions, Reaction kinetics, Thermodynamics, Electric charge.

Thermal energy reactions of C (-) with oxygen, carbon dioxide, carbon monoxide, and nitrous oxide were measured by the flowing afterglow technique. The C (-) was produced by 100-eV electron impact on CH₄ and buffered in a large excess of He. The C (-) was largely in its ground state, since no charge transfer with O₂ was observed. The observed 300 K rate constants for the reactions studied are listed. They are believed to be reliable to plus or minus 10%. APTIC-23339

DISSOCIATIVE ATTACHMENT IN CO AND FORMATION OF C (-)

J. Chem. Phys., 53 (7):2663-2667, Oct. 1, 1970, 17 refs.

A. Stamatovic, and G. J. Schulz.

Identifiers: *Carbon monoxide, *Dissociation, *Ions, Mass spectrometry.

The formation of 0 (-) and C (-) by the reactions e + CO yields 0 (-) + C and e + CO yields 0 + C (-) was studied by means of an apparatus consisting of an electron gun that produced monochromatic electrons describing a trochoidal motion in crossed electric and magnetic fields, a collision chamber, and an electron collection system. Ions formed in the collision chamber were extracted, analyzed by a quadrupole mass spectrometer, and then detected by a channeltron multiplier. Within the 0.07 eV electron energy distribution of the trochoidal monochromator, the 0 (-) current exhibited a vertical onset at threshold. Structure was observed at higher values. The cross section of the production of C (-) showed an onset at 10.20 plus or minus 0.04 eV, a peak at 10.4 eV, and a second peak at 10.9 eV. The cross section at the first C (-) peak was smaller than the peak cross section for 0 (-) production by a factor of 3300 plus or minus 20%. Based on the previously determined value for the 0 (-) cross section (2 times 10 to the minus 19th power sq cm), the peak cross section for C (-) formation was calculated as 6 times 10 to the minus 23rd power sq cm. (Author abstract modified) APTIC-23341

7. EFFECTS - HUMAN HEALTH

RELATIONSHIP OF AIR POLLUTION TO ALLERGIC DISEASES. (FINAL REPORT).

Minnesota Univ., Minneapolis, Univ. Health Service and Minnesota Univ., Minneapolis, School of Public Health, PHS Grant AP00090, 143p., Dec. 1969, 28 refs.

D. W. Cowan, and H. J. Paulus.

Identifiers: *Allergies, *Asthma, Adults, Males, Females, Barley, Corn, Oats, Wheat, Health statistics, Respiratory system, Dusts, Fumes, Grain processing, Air quality measurements, Statistical analyses, Transport, Winds, Humidity, Pressure (atmospheric), Temperature (atmospheric), Sulfur oxides, Sulfur dioxide.

An asthma study involving students at the University of Minnesota was conducted through 8 academic years covering 1959-1967. Data was gathered on asthma incidence in a special student group by completion of asthma diaries and by information obtained on visits to the allergy clinic. All students in the study were given a set of skin tests including many involving grains and grain pollutants. Data on the physical and chemical characteristics of the atmosphere were obtained by means of a sampling network located on and near the University campus. Five of eight years of data were assembled, edited, and processed for statistical analysis by computer. A completely randomized block statistical analysis scheme was used. Environmental parameters were analyzed as treatment effects. Linear regression was performed for asthma on the vector components of wind direction. The strongest association with student asthma was observed for smoke spot readings. A strongly positive relationship, significant at the 0.1% level, was found for data from two specific stations. Students with a positive skin test to grain mill dust showed a significantly higher response to smoke spot than students with a negative skin test. A significant relationship was also found for sulfur dioxide concentration and student asthma. The association of wind direction with asthma showed that east and west winds tend to produce above average attack rates. All of the observations support the conclusion that both particulate and gaseous air pollutants induce asthma. There is no evidence that specifically indicates that grain mill pollution is a cause of asthma attacks among the student body. Weather parameters, with the exception of temperature and relative humidity, were only weakly associated with asthma attacks. A positive association with barometric pressure change and days with rainfall was determined, indicating the possibility of a physical induction of asthma. The strong inverse relationship with temperature may be due to either

a physical induction of asthma by cold air or a correlation with sulfur dioxide. The positive relationship with temperature may be due to either a physical induction of asthma by cold air or a correlation with sulfur dioxide. The positive relationship of student asthma with humidity is most readily interpreted by its effect on airborne particles. In general, meteorological effects appear to be less important than air pollution. (Author summary modified) APTIC-19073

INHALATION CARCINOGENESIS IN MAN: ENVIRONMENTAL AND OCCUPATIONAL HAZARDS.

National Cancer Inst., Bethesda, Md. and Atomic Energy Commission, Oak Ridge, Tenn., Proc. Conf. Inhalation Carcinogenesis, Gatlinburg, Tenn., 1969, p. 3-12, 34 refs. (Oct. 8-11.) Norton Nelson.

Identifiers: *Occupational health, *Breathing, *Lung cancer, Humans, Smoking, Carcinogens, Asbestos, Particulates, Chromates, Radon.

There has now accumulated extensive evidence on the induction of lung cancer through inhalation in man. The best documented and most decisive evidence related to occupational exposures. Examples would include radon daughters, chromatic chemical manufacturing and asbestos exposure. There is also evidence suggesting that the generally lower levels of exposures found in community air may be associated with an increased risk of lung cancer. Selected examples of such associations are examined and discussed, and the relationship of laboratory studies to such problems is considered. (Author abstract modified) APTIC-19647

EFFECTS OF NO₂ IN HAMSTERS: AUTORADIOGRAPHIC AND ELECTRON MICROSCOPIC ASPECTS.

National Cancer Inst., Bethesda, Md. and Atomic Energy Commission, Oak Ridge, Tenn., Proc. Conf. Inhalation Carcinogenesis, Gatlinburg, Tenn., 1969, p. 271-281, 7 refs. (Oct. 8-11.) Jerome Kleinerman.

Identifiers: *Hamsters, *Respiratory system, *Nitrogen dioxide (no2), Pathological techniques, Cells, Cilia, Enzymes, Lipids, Bronchi, Lungs, Alveoli, Epithelium, Radiation measuring systems, Electron microscopy, Radioactive tracers, Surfactants, Acute.

Nitrogen dioxide has been used as an agent to study experimental injury and repair in the lungs of hamsters. Although repair is nearly complete within 2 weeks after acute exposure, a transitory, localized, and delayed hyperplasia is observed in the region of the respiratory bronchiole. The dynamics of this epithelial replacement has been studied by tritiated thymidine labeling and autoradiography. After an acute 6-hr exposure to 100 ppm of NO₂ there is an intense burst of epithelial proliferation which peaks at about 24 hr. This peak is most intense in the major bronchi, returning to normal levels within 4 days. In the distal respiratory tract, the peak is delayed until 48 hr, is lesser in degree, and returns to normal levels within 7 days. This increase in thymidine index persists to an even greater extent in the respiratory bronchiolar region after prolonged NO₂ exposures. Electron microscopic study of NO₂ injured hamster lungs has revealed that ciliated cells do not change in number, but the number of secretory cells and secretory granules or inclusions diminishes precipitously. Lysosomal structures increase dramatically after NO₂ exposure. In the distal lung, the number of type II alveolar cells increases in the respiratory bronchiolar and alveolar regions, as does the number of phagocytic cells. These findings suggest a depression of mucopolysaccharide production, an increase in surfactant or lung phospholipid production, and an increase in lysosomal enzyme content. (Author abstract) APTIC-19648

STUDIES IN INHALATION CARCINOGENESIS: A CRITIQUE.

National Cancer Inst., Bethesda, Md. and Atomic Energy Commission, Oak Ridge, Tenn., Proc. Conf. Inhalation Carcinogenesis, Gatlinburg, Tenn., 1969, p. 445-453. (Oct. 8-11.)
 Marvin A. Kastenbaum, and Toby J. Mitchell.
 Identifiers: *Breathing, *Cancer, *Experimental methods, Laboratory animals, Statistical analyses.

Current and future work in inhalation carcinogenesis, where studies are made with multiple treatment, would profit from a more conscientious use of factorial experiments. This would enable investigators to examine simultaneously the effects of several treatments, and to determine in advance of an experiment, or a series of experiments, how many animals will be needed to produce results that accurately approximate the 'true' condition. Researchers might also consider projects that produce near-certain results with smaller numbers of animals, over a shorter time span. Difficulties with budget changes, high staff turnover, and other problems often lead to faulty results in long-term experiments involving large numbers of animals. (Author abstract)
 APTIC-19649

INFLUENCE OF NITROGEN DIOXIDE ON RESISTANCE TO RESPIRATORY INFECTIONS.

National Cancer Inst., Bethesda, Md. and Atomic Energy Commission, Oak Ridge, Tenn., Proc. Conf. Inhalation Carcinogenesis, Gatlinburg, Tenn., 1969, p. 243-257. 8 refs. (Oct. 8-11.)
 Richard Ehrlich, Mary C. Henry, and James Featers.
 Identifiers: *Pulmonary resistance, *Bacteria, *Nitrogen dioxide (NO₂), Mice, Primates, Mortality, Alveoli, Lung clearance, Respiratory diseases, Emphysema, Pneumonia, Acute, Chronic.

Studies suggest that reduction in resistance to bacterial pneumonia is the most sensitive indicator of the biological effects of nitrogen dioxide. Exposure of Swiss albino mice or of inbred mice to 3.5 ppm of NO₂ for 2 hr resulted in a significant increase in mortality from respiratory challenge with airborne *Klebsiella pneumoniae*. Continuous exposures to 0.5 ppm of NO₂ for 3 months also resulted in decreased resistance to bacterial pneumonia, while intermittent exposures to 0.5 ppm NO₂ for 6 or 18 hr per day produced similar effect after 6 months. The various conditions of exposure to NO₂ reduced the capacity of the animals to clear viable bacteria from the lung. In addition, chronic exposures resulted in expansion of lung alveoli, and the lesions appeared to be consistent with the development of early emphysema. Recent data on acute and chronic exposure of squirrel monkeys to 5 to 50 ppm of NO₂ suggest that their resistance to infection initiated by respiratory challenge with airborne *K. pneumoniae* or influenza virus is also significantly reduced. (Author abstract modified)
 APTIC-19650

CHEMICAL DEFINITIONS OF INHALATION HAZARDS.

National Cancer Inst., Bethesda Md. and Atomic Energy Commission, Oak Ridge, Tenn., Proc. Conf. Inhalation Carcinogenesis, Gatlinburg, Tenn., 1969, p. 13-26. 40 refs. (Oct. 8-11.)
 Hans L. Falk.

Identifiers: *Epidemiology, Humans, Cells, Enzymes, Lungs, Tissues, Inhibition, Breathing, Smoking, Synergism, Cancer, Carcinogens, Respiratory diseases, Emphysema, Beryllium, Nickel, Asbestos, Automotive emissions, Aerosols, Dusts, Nitrogen oxides, Sulfur oxides, Gases.

The chemical composition and physical characteristics of aerosols, dusts, and gases may be of comparable importance as factors leading to diseases of the lung. Environmental pollutants often work together in synergistic fashion to alter cells and tissues towards the development of various disease states that may prove irreversible. In-

dividual compounds such as oxides of sulfur and nitrogen are considered for their role in reducing effective defense mechanisms of the lung and for their contribution towards permanent changes that ultimately lead to emphysema or cancer. Factors which were originally associated only with specific occupations but which have tended to become generalized hazards for the urban population, such as exposure to asbestos fibers, beryllium, and nickel are discussed. Involuntary as well as voluntary air pollution, auto traffic pollution and cigarette smoking are discussed in terms of the importance of each, identifying where possible the role of significant components in the development of disease. The contribution of various dusts, even 'inert carriers,' as well as that of simple organic chemicals of ubiquitous occurrence in polluted air and that of carcinogens responsible for irreversible changes in susceptible cells, is discussed. Pollutant in the air are considered for their enzyme-inducing capacity as well as for their inhibitory action. Physiological changes leading to tolerance are explored as not necessarily being free of hazards. Viral infection and air pollution have reciprocal action that can contribute toward disease of the lung. (Author abstract modified)
 APTIC-19661

EXPERIMENTAL INHALATION STUDIES: EQUIPMENT AND PROCEDURES.

National Cancer Inst., Bethesda, Md. and Atomic Energy Commission, Oak Ridge, Tenn., Proc. Conf. Inhalation Carcinogenesis, Gatlinburg, Tenn., 1969, p. 55-76. 47 refs. (Oct. 8-11.)
 Morton Lippmann.
 Identifiers: *Deposition, *Instrumentation, Laboratory animals, Humans, Respiratory system, Breathing, Pollutants, Breathing apparatus, Controlled atmospheres, Experimental equipment, Experimental methods, Exposure methods, Exposure chambers.

The factors that affect the deposition of airborne contaminants in the respiratory tract are reviewed, including the physical and chemical properties of the contaminant and the airway dimensions and respiratory characteristics of the subject exposed. Design features of systems for experimental inhalation exposures are outlined. The discussion includes delivery techniques (nasal tubes, face masks, and chambers for daily and lifetime exposures). Critical parameters affecting chamber performance are reviewed. Techniques and equipment for producing and monitoring controlled test atmospheres and for studies of the deposition and translocation of respirable particles are described. (Author abstract)
 APTIC-19662

ATMOSPHERIC POLLUTION: A GROWING PROBLEM IN PUBLIC HEALTH.

Am. J. Public Health, vol. 45:298-305, 1955. 24 refs. (Presented to the Am. Public Health Assoc., 82nd Annu. Meet., Buffalo, 1954.)

Morris Katz.

Identifiers: *Epidemiology, *Respiratory diseases, *Smog, Morbidity, Mortality, Synergism, Cancer, Cardiovascular diseases, Pneumonia, Tuberculosis, Detroit, Coal, Ammonium chloride, Sulfates, Area surveys, Air pollution episodes, Acute, Chronic.

With the growth of population and industry, air pollution problems have increased and present an increasing hazard to public health. Based on a pathological comparison of the conditions produced in those affected, the London, Donora, and Meuse Valley air pollution episodes are believed to be similar. It was impossible to state that any one pollutant could have caused death, and a review of previous smog incidents did not provide any valuable information for determining the cause of deaths and illnesses. It was concluded that the irritants were derived from the combustion of coal and its products. The lethal effects were confined to those already suffering from chronic respiratory and cardiovascular disorders.

It has been suggested that the soluble salts of ammonium sulfate and chloride may be responsible for respiratory irritation in smog episodes. Knowledge of the chronic effects of exposure to atmospheric irritants is entirely based on industrial medical experience. Chronic injury could be demonstrated more readily by studies of the distressed portion of a population group, those with functional diseases of the respiratory or cardiovascular system. The Detroit River area health study represents a scientific attempt to determine the effects of prolonged exposure to the contaminants of a highly industrialized region. Data have been collected on the distribution and incidence of tuberculosis, pneumonia, and cancer which may be of value if applicable to the selected health study areas.
 APTIC-19671

THE ROLE OF TOPICAL AND SYSTEMIC FACTORS IN EXPERIMENTAL RESPIRATORY CARCINOGENESIS.

National Cancer Inst., Bethesda, Md. and Atomic Energy Commission, Oak Ridge, Tenn., Proc. Conf. Inhalation Carcinogenesis, Gatlinburg, Tenn., 1969, p. 353-371. 61 refs. (Oct. 8-11.)
 Ruggero Montesano, Umberto Saffiotti, and Philippe Shubik.
 Identifiers: *Respiratory system, *Cancer, *Carcinogens, *Exposure methods, Hamsters, Attack rates, Cells, Bronchi, Lungs, Trachea, Synergism, Bronchial cancer, Tracheal cancer, Tumors, Hydrocarbons, Benzopyrenes, Amines, Iron oxides.

During the past decade, considerable effort has been devoted to the development of experimental models for the study of the pathogenesis of lung cancer in experimental animals. The Syrian golden hamster has been the species most extensively used. It proved markedly susceptible to various respiratory carcinogens and conveniently refractory to chronic pulmonary infections. Direct administrations of polynuclear hydrocarbons into the respiratory tract were first performed with colloidal gelatin suspensions; most subsequent work made use of finely dispersed ferric oxide in saline as a carrier for crystalline carcinogen particles. High incidences of bronchogenic carcinomas were obtained by the latter method, using benz (a)pyrene and ferric oxide. The tumors most frequently observed were squamous cell carcinomas. Repeated intratracheal instillations were most effective, although some tumors could be induced even by a single administration. Direct dose-response correlations were demonstrated by varying the number of administrations, their frequency, and the levels of each dose given for different lengths of time. The systemic carcinogen diethylnitrosamine was used for dose-response studies after subcutaneous administrations to adult or newborn hamsters. The tumor response was consistently localized in the upper respiratory tract; only a few tumors were seen in the bronchi and lungs. When such systemic exposure was combined with the intratracheal administration of benzo (a)pyrene and ferric oxide or even of ferric oxide alone, a marked synergistic tumor response was observed in the lower respiratory tract. The role of the time sequence, specificity, and dose of the factors involved in this synergistic action is presently under study. (Author abstract modified)
 APTIC-19677

EFFECT OF LOW SULFUR DIOXIDE CONCENTRATIONS OF THE ANIMAL ORGANISM.

U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 8:79-89, 1963. 13 refs. (B. S. Levine, ed.) CPSTI: 63-11570

E. K. Lobova.

Identifiers: *Enzymes, *Toxicity, *Sulfur dioxide, Rats, Blood cells, Heart, Digestive system, Liver, Glands, Kidneys, Nervous system, Lungs, Ussr, Sulfur oxides, Hydrogen sulfide, Maximum allowable concentration, Acute, Chronic.

Animal studies on the acute and chronic biochemical effects of inhaling low sulfur dioxide concentrations were conducted. Inhalation of 20 mg/cu m SO₂ during a single 4-hr exposure produced physiological changes in white rats; the same was true of 0.5 and 0.1 mg/cu m, the present allowable limits of SO₂ concentration in community ambient air. Exposure to 20.0 mg/cu m lowered the activity of spleen tissue dehydrogenase by 50%. Dehydrogenase activity of other organ tissues was reduced by 10-36%. Cholinesterase activity of small intestinal mucosa was reduced in many instances by 29.3% and in other organ tissues by 6-16%. Chronic exposure to 0.5 mg/cu m lowered the activity of spleen tissue dehydrogenase by 54.6%; dehydrogenase and cholinesterase activity also decreased. Such reduction in tissue enzymic activity was noted in most but not all organ tissues. Vitamin C content in small intestinal mucosa, liver, and kidneys fell by 9-15%. Chronic exposure of rats to 0.1 mg/cu m SO₂ elicited short-duration reversible shifts in carboxanhydrase activity. On the basis of these results it is concluded that daily inhalation by indoor workers of air containing 20 mg/cu m SO₂, the present limit over a period of years may seriously affect their health. It is recommended that SO₂ be completely eliminated from exhaust gases before they are discharged into the atmosphere, and that the maximum allowable concentration of SO₂ in atmospheric air be 0.13 mg/cu m. The same limit should apply to hydrogen sulfide which, like SO₂, has an inhibiting effect on anaerobic cell respiration. (Author conclusions modified)

APTIC-20376

TOLERANCE CRITERIA FOR CONTINUOUS INHALATION EXPOSURE TO TOXIC MATERIALS. III. EFFECTS ON ANIMALS OF 90-DAY EXPOSURE TO HYDRAZINE, UNSYMMETRICAL DIMETHYLHYDRAZINE (UDMH), DEACABORANE, AND NITROGEN DIOXIDE. ASD-TR-61-519 (III), 84p., Feb. 1964. 42 refs. Personal Author Not Recorded.

Identifiers: *Pathological techniques, *Toxicity, Mice, Primates, Rats, Hematology, Urinalysis, Respiratory diseases, Fuels, Missiles and rockets, Hydrazines, Boron compounds, Nitrogen dioxide (no2).

Monkeys, rats, and mice were exposed continuously for 90 days to hydrazine (0.78 ppm), unsymmetrical dimethylhydrazine (0.56 ppm), deacaborene (0.047 ppm), and nitrogen dioxide (4.5 ppm), to determine the inhalation toxicity of these substances which are employed as high-energy fuels in the development of advanced guided missile systems. All three species developed various gross toxic effects after exposure to hydrazine, but this chemical was more toxic to mice and rats than monkeys. The monkeys became thin and weak and lost their appetites; fatty degeneration of the liver was common, while renal and myocardial involvement were infrequently seen. Lesions in both rats and mice included macrophage and/or polymorphonuclear leukocyte infiltration in the lung and fatty degeneration of the liver, while infrequent lesions were foci of polymorphonuclear leukocyte infiltration, focal necrosis, and fibrosis in the myocardium. No significant alterations in the various clinical laboratory studies, including hematology, blood chemistry, urinalysis and functional tests, were observed in the monkeys or rats when exposed to UDMH, but the swim time (stress test) of both rats and mice was reduced. Monkeys showed degenerative lesions in the liver, mice showed hemosiderin deposit in the Kupffer and/or liver cells, and lesions in the rats were limited to vacuolization of renal tubular epithelium and necrosis of the heart. All animals appeared to be weak and refused to eat and drink after exposure to deacaborene, and all three species suffered from trembling and convulsions. The monkeys had no apparent changes in clinical laboratory values or functional tests, but pathological findings included fatty changes and congestion of the liver, with occasional lesions of the kidney and calcification and degeneration of the myocardium. Rats had increased erythrocyte counts and hematocrits,

urobilinogen was decreased, pulmonary changes were marked, and interstitial nephritis was also common. The mice had a decrease in hemoglobin with normal erythrocyte counts; pathological changes in the lung were also prevalent, and vacuoles occurred occasionally in the renal tubules. Nitrogen dioxide exposure caused serious depression and weakness, lost appetite and less body weight gain, in all three species. No apparent abnormality in clinical laboratory data was observed in rats and mice, but monkeys showed increase in values of both SGOT and SGPT. Monkeys showed occasional liver involvement, while acute bronchiectatic bronchopneumonia and eosinophilic hyaline alveolar membranes were frequently seen in rats. In mice, lesions were often found in the lung.

APTIC-20423

DETECTION AND EPIDEMIOLOGY OF ATMOSPHERIC POLLUTION DUE TO DOMESTIC HEATING PLANTS IN PARIS. For primary bibliographic entry see Field 03.

APTIC-22152

CHARGE DISTRIBUTION ON POLYSTYRENE AEROSOLS AND DEPOSITION IN THE HUMAN NOSE. Aerosol Sci., vol. 1:135-146, 1970. 21 refs. F. A. Fry.

Identifiers: *Deposition, *Aerosols, *Electric charge, Humans, Nostrils, Great Britain, Spectrometry, Styrenes.

A method is described for measuring the charge distribution on monodisperse polystyrene aerosol particles, using a parallel-plate charger spectrometer. Data are presented on the magnitude of the charges carried by aerosol particles produced by atomization of a suspension of the particles in alcohol, and on the residual charges after attempted equilibration by mixing with a bipolar atmosphere produced by krypton-85 sources. The measured values of charge, after charge reduction, are compared with those predicted by the Boltzmann distribution of charge. The reduction in charge had no significant effect upon deposition of the particles in the nasopharyngeal region of the human respiratory tract. (Author abstract)

APTIC-22162

THE CHATTANOOGA SCHOOL CHILDREN STUDY: EFFECTS OF COMMUNITY EXPOSURE TO NITROGEN DIOXIDE. I. METHODS, DESCRIPTION OF POLLUTANT EXPOSURE, AND RESULTS OF VENTILATORY FUNCTION TESTING. J. Air Pollution Control Assoc., 20 (8):539-545, Aug. 1970. 14 refs. Carl M. Shy, John B. Creason, Martin E. Pearlman, Kathryn E. McClain, and Ferris B. Benson.

Identifiers: *Chattanooga, *Children, *Ventilation (pulmonary), *Nitrogen dioxide (no2), Students, Socio-economic factors, Thresholds, Tennessee, Suspended particulates, Soiling index, Nitrates, Sulfates.

Elementary schools in four areas of Greater Chattanooga were selected for a study of the effects of community exposure to nitrogen dioxide. One area, in close proximity to a large TNT plant, had high NO₂ exposure, another had relatively high suspended particulate exposure, and two areas served as 'clean' controls. The similarity of the economic levels of the High-NO₂ and Control areas and the moderately lower economic level of the High-Particulate area were documented. Pollutant concentrations for NO₂ gas, suspended nitrates and sulfates, total suspended particulates, and soiling index were measured at stations located within the study areas. Ventilatory performance of second-grade school children in the High-NO₂ exposure area was significantly lower than the performance of children in the Control areas. The data suggested that ventilatory per-

formance was adversely affected only when an NO₂ threshold was exceeded but that above this threshold no further impairment of performance could be detected. (Author abstract)

APTIC-22168

THE RELATIONSHIP BETWEEN CHRONIC BRONCHITIS AND CLIMATIC FACTORS. (Untersuchungen ueber die Zusammenhaenge chronischer Bronchitis und Klimafaktoren). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 30:105-108, 1970. Ernst Siresemann.

Identifiers: *Bioclimatology, *Bronchitis, Chronic, Humans, Respiratory system, Bronchi, Allergies, Asthma, Germany, Meteorology, Micrometeorology.

In the attempt to relate chronic bronchitis to meteorological factors, fast changing meteorological parameters were correlated with the dynamics of the respiratory system of a subject stricken with a disease whose functional substrate, the mucous membrane, is not endowed with fast but rather with very sluggish reactivity. This caused a time lag; the secretion of the pathological bronchial mucus responding to relatively weak meteorological stimuli did not become manifest until hours or days later. Like an inflammatory process, the secretion of mucus always outlasts the triggering noxa. Another difficulty rendering the solution of the task difficult at this time is that smoking by experimental subjects masks the effects of climatic factors on chronic bronchitis. Yet another uncertainty is in the varying etiology of the disease which in some cases can be of strictly exogenous allergic nature manifested as an asthmatic bronchitis without asthma which responds to climatic influences by a completely different mechanism than chronic bronchitis.

APTIC-22344

THE RELATIONSHIP BETWEEN PULMONARY FUNCTIONAL DEFECTS, THEIR CLINICAL SEVERITY, WEATHER, AND AIR POLLUTION (SO₂ CONCENTRATION) IN OBSTRUCTIVE BRONCHITIS. (Ueber den Zusammenhang von Lungenfunktionsstoerung, klinischem Schweregrad, Wetter und Luftverunreinigung (SO₂-Konzentration) bei obstruktiver Bronchitis). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 30:89-103, 1970. 34 refs.

J. Meier-Sydow, W. Beck, H. Ehrenforth, W. Ewald, and E. Gonsior.

Identifiers: *Bioclimatology, *Pulmonary resistance, *Bronchitis, Germany, Plethysmography, Statistical analyses, Meteorology, Humidity, Pressure (atmospheric), Sulfur dioxide.

A correlation between plethysmographically determined respiratory resistance, subjective symptoms of bronchitis (general well being, shortness of breath), weather (barometric pressure, relative humidity, and visibility), and air pollution (sulfur dioxide concentration) was sought by observation of 26 patients suffering from obstructive bronchitis for an average period of 34.5 days in winter and 40.8 days in summer. The findings were evaluated by multiple regression analysis performed separately for each patient. In about half the patients, a statistically significant correlation was found between respiratory resistance, SO₂ concentration, and barometric pressure, while the incidence of a statistically significant correlation between subjective well being, shortness of breath, relative humidity, and visibility was much less frequent. Respiratory resistance reacted to weather parameters much more sensitively than changes in subjective well being would have indicated. A correlation between respiratory resistance and subjective feeling was found only rarely.

APTIC-22345

EXPERIENCE GAINED DURING A MEDICAL METEOROLOGICAL TEST YEAR.

(Erfahrungen aus einem Medizin-Meteorologischen Testjahr). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 30:53-88, 1970. 85 refs.

E. Wedler.

Identifiers: *Bioclimatology, *Diseases and disorders, Humans, Morbidity, Mortality, Asthma, Germany, Statistical analyses, Atmospheric movements, Temperature (atmospheric).

The coincidence of extreme biological and meteorological-geophysical factors in West Berlin (during July 10-14, 1959, a mortality increase of 83% coincided with excessive temperatures of up to 40°C accompanied by the most severe storms of the year) initiated a study of the effect of weather as defined by the International Society of Biometeorology on as many case histories of certain diseases as could be collected in West Berlin. The degree of medical-meteorological correlation was determined by statistical analysis using punch cards and a computer. Altogether, 7715 clinical cases covering 76 different diseases were studied in addition to 45,000 individual observations pertaining to asthma. The principal problem encountered was the inadequacy of a period of 1 year for a meaningful evaluation of possible existing correlations. A preliminary evaluation of the coincidence of the beginning of pulpitis, periodontitis and tooth abscesses with a passage of cold fronts and occlusions disclosed a 193% increase in the incidence of all three diseases on days when cold fronts and atmospheric occlusions were recorded. APTIC-22361

SURVEY OF THE HAZARDS OF THE CHEMICAL AGE.

Pure Appl. Chem., 21 (3):419-436, 1970. 11 refs.

Rene Truhaut.

Identifiers: *Toxicity, *Health impairment, Humans, Mortality, Occupational health, Drugs, Toxic tolerances, France.

A survey of potential health hazards through ingestion of toxic chemicals is presented. Different kinds of toxicity and their respective consequences are described. Processes of absorption and cumulative exposure to poisons are considered. Occupational exposure, therapeutic risks, food poisoning, and community exposure through air pollution are discussed. General principles of prevention against the hazards of chemical poisoning are defined. Standards of purity, emergency measures, defining permissible pollutant concentrations in the work environment or in the ambient atmosphere, determining acceptable daily intake for chemical products, and the problems raised by the necessity for control, by means of adequate analytical methods, of the environment are all discussed. (Author abstract modified)

APTIC-22405

THE ABILITY OF BIOLOGICAL SYSTEMS TO ASSIMILATE OILS.

American Petroleum Inst., New York, Div. of Refining, Proc. Am. Petrol. Inst., Sect. III, vol. 50:436-465, 1970. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 35th, Houston, Tex., May 13-15, 1970.)

Edwin L. Barnhart, and George J. Kehrberger. Identifiers: *Microorganisms, *Fuel oils, Cell metabolism, Hydrocarbons.

A laboratory study involving both continuous and batch biological units was undertaken to examine the capability of biological systems to assimilate oil. The hydrocarbons studied were a crude oil, a slop oil, a spent crank case oil, and a vegetable oil. In the continuous study, the test substrates were fed at different flow rates into the reaction chamber and the response of the microbial population to these hydrocarbon loadings was monitored. The tests conducted to monitor the system's performance included soluble organic removal (COD and BOD), suspended solids (cell) buildup, oxygen

usage, hexane buildup, and settling characteristics of the microbial population. At high oil loadings, the biological system's failure was a physical phenomenon. These oil loadings caused a change in the physical properties of the microbial population resulting in a reduction in the settleability of the biological population. However, the test material had little effect on the biochemical phenomena occurring, as the BOD and COD values measured were very similar to the control units. For the lightly loaded units, the oil addition has a minor effect on the biological system's performance. In many cases, small perturbation of solids in the effluent stream were monitored, but the system always responded and operated in a similar manner as the control unit. The batch study employing respirometer techniques demonstrated that the test materials are biodegradable to a degree, but require long detention periods. Vegetable oil and slop oil were the easiest materials to degrade. (Author abstract modified)

APTIC-22415

EPIDEMIOLOGICAL ASPECTS OF AIR POLLUTION.

(Aspectos epidemiológicos de la contaminación atmosférica). Text in Spanish. Gac. Med. Mex., 100 (3):266-279, March 1970. 34 refs.

Blanca Raquel Ordóñez.

Identifiers: *Mexico, *Respiratory diseases, *Epidemiology, Air pollution episodes, Acute, Chronic, Seasonal, Lung cancer, Asthma, Bronchitis, Emphysema, Non-urban areas, Urban areas, Particulates, Air quality measurements, Sulfur dioxide.

The tools of epidemiology are applied to the study of relationships between pollution and health problems, with special attention to Mexico City and the Distrito Federal. Illnesses resulting from dramatic incidents of pollution where permissible limits are exceeded are relatively easy to study. More difficult to assess are the alleged connections between such diseases as chronic bronchitis, emphysema, and primary cancer of lungs and a long-term exposure to pollution at lower concentrations. The most serious pollution problem areas in Mexico, outside the metropolitan area of Mexico City, are Guadalajara, Monterrey, and Tepic. Since 1967 the Mexican Department of Health has been setting up stations for continuous sampling in the area around the capital (Valle de Mexico), where particulate matter, sulfur dioxide, and total sulfur content of the atmosphere can be determined. A study conducted by the Pan American Bureau of Health (OSP) July 1967 - June 1968 makes possible a comparison of pollution measurements in the Mexico City area with those of other Latin American cities. Dust measurements indicate that Mexico has the most serious problems of any of the countries in the group studied (Argentina, Brazil, Colombia, Chile, Peru). In the case of Chile (Santiago) and Argentina (Buenos Aires), the factors created by a temperate climate (which introduces the problem of domestic heating) makes comparison difficult. Average values for Mexico City from October 1967 to June 1968 were 158.2 micrograms/cu m while from November 1968 to October 1969 the amount had been reduced to 131.8 micrograms. Both of these figures were higher than those obtained in London and in the United States. Mexico City also has the highest sulfur dioxide rate for Latin America. Measurements from October 1967 to June 1968 showed an annual average of 95 micrograms/cu m for Mexico City, and 133 micrograms from November 1968 to October 1969, while during the same period the figure for New York City was from 560 to 840 micrograms. Acute respiratory illnesses decreased by 29.4% in urban areas outside the Distrito Federal between 1964 and 1968, and by 23.5% in rural areas, while in the Distrito Federal there was an 18.7% increase. Chronic bronchitis, emphysema, and asthma showed increased in all areas: 12.7% in urban Mexico 18.9% in rural areas, 34.8% in the Distrito Federal.

APTIC-22426

ALTERATIONS OF THE UPPER RESPIRATORY TRACT CAUSED BY AIR POLLUTION.

(Alteraciones de las vías respiratorias superiores debidas a contaminación atmosférica). Text in Spanish. Gac. Med. Mex., 100 (3):279-285, March 1970.

Jorge Corvera, and Amado Gonzalez-Mendoza.

Identifiers: *Respiratory system, *Settling particles, *Suspended particulates, Esophagus, Bronchi, Larynx, Nostrils, Respiratory functions, Respiratory diseases.

A review is made of the effects created in the respiratory system by pollutants, especially particulate matter (suspended and settling). The mucosa of the nose normally retains all particles larger than 6 micron in diameter, 50% of the 2-micron particles, and 20% of those less than 1 micron in size. Particles not retained in the nose are deposited in the primary and secondary bronchi. A tussive action causes the particles trapped in the bronchi to move upward to a point where they can be transferred to the esophagus, though which they pass into the digestive tract. The heaviest concentrations of such material are in the nasal fossa, the rhinopharynx, and the larynx. Illness can be caused by direct toxic action, by a chronic trauma, or by an oncogenic effect. The manner in which these phenomena bring about histological changes is discussed.

APTIC-22427

AIR POLLUTION AND HUMAN HEALTH.

Science, 169 (3947):723-733, Aug. 21, 1970. 134 refs.

Lester B. Lave, and Eugene P. Seskin.

Identifiers: *Morbidity, *Mortality, *Diseases and disorders, Economic losses, Socio-economic factors, Adults, Infants, Absenteeism, Occupational health, Cancer, Lung cancer, Cardiovascular diseases, Bronchitis, Emphysema, Pneumonia, Urban areas, Statistical analyses, Sulfates.

Problems of isolating health effects are characterized, and quantitative estimates of the effect of air pollution on various diseases are derived. The model implicit in this detailed review of the literature is a simple linear equation wherein the mortality or morbidity rate is a linear function of the measured level of pollution and, possibly, of an additional socioeconomic variable. Multiple regression analyses on data from England relate air pollution and socioeconomic variables to bronchitis, lung cancer, other cancers, and pneumonia. Air pollution is a significant explanatory variable in the first ten regressions which attempt to explain the bronchitis death rate, but in only three cases is the socioeconomic variable significant. One study found the cancer mortality rate to be 25% higher in polluted areas than in areas of relatively clean air. It was concluded on the basis of several studies that a substantial abatement of air pollution would lead to 10-15% reduction in the mortality and morbidity rates for heart disease, emphysema and other respiratory diseases are also correlated with pollution and occupational exposure, and figures are cited for absences of postmen and bus drivers. Regressions relating infant and total mortality rates to air pollution and other factors are presented tabularly for 114 Standard Metropolitan Statistical Areas in the U. S. The minimum atmospheric concentration of sulfates is shown in Regressions 2, 4, 6, and 8 to be a significant explanatory variable in three categories of infant death rates. Direct and indirect costs from diseases are also considered. The total annual cost that would be saved by a 50% reduction in air-pollution levels in major urban areas is estimated to be \$2080 million.

APTIC-22521

NOXIOUS EFFECT OF CARBON MONOXIDE, SULFUR DIOXIDE, AND THEIR COMBINATIONS ON THE FEMALE RATS FERTILITY.

(K voprosu o vrednom deystvii okisi ugleroda, sernistogo gaza i ikh kombinatsii na plodovitost' samok krysa). Text in Russian. Gigena i Sanit., no. 5:100-101, 1970.

M. I. Mamatsashvili.

Identifiers: *Rats, *Reproduction, *Carbon monoxide, *Sulfur dioxide, Maximum allowable concentration, Glands, Hormones.

Female rats were subjected for 72 days to inhalation poisoning with CO at 2 and 1 mg/cu m, and SO₂ at 4 and 0.15 mg/cu m, and a mixture of both at 2 and 4 mg/cu m, respectively, to determine the gonadotropic effect of these air pollutants. Studies of estrous cycle and fertility in these animals revealed hormonal disturbances (in all cases excepting SO₂ at 0.15 mg/cu m) indicative of increased functioning of the pituitary body, greatest effect being seen with combined CO-SO₂ exposure. These results cast some doubt on the advisability of the presently-accepted 1 mg/cu m maximum allowable concentration for carbon monoxide.

APTIC-22531

HYGIENIC ASSESSMENT OF TETRAHYDROFURAN AS AN ATMOSPHERIC POLLUTANT.

For primary bibliographic entry see Field 11.

APTIC-22534

AIR POLLUTION AND RELATED DISEASE OF INDUSTRIAL DISTRICTS IN NORTHERN KYUSHU.

(Kita Kyushu kogyochiiki no taikosen to mitsunishippei no chosa kenkyu). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 16 (14):913-920, Nov. 15, 1969. Namio Saruta, Nobu Ishinashi, Yasushi Kodama, Eisaburo Kokubu, and Yoko Shikatori. Identifiers: *Health statistics, *Air quality measurements, Humans, Morbidity, Sinuses, Lung cancer, Eye irritation, Respiratory diseases, Asthma, Bronchitis, Laryngitis, Tuberculosis, Japan, Urban areas, Commercial areas, Industrial areas, Residential areas, Automotive emissions, Combustion products, Particulates, Dust fall, Colorimetry, Lead peroxide candle, Benzo (3-4)pyrene, Carbon monoxide, Sulfur oxides.

The results of long-term measurements of atmospheric pollutants derived largely from adjacent industrial sites in Northern Kyushu are reported in the form of tables and brief comments on related diseases, which are typically prevalent in industrial areas, although definite relationship between those diseases and the air pollution are not conclusively demonstrated because of the lack of data on cigarette smoking. The northern parts of Kyushu are grouped to five districts and the five districts are also classified by the regional differences: industrial, business, and residential. Each of the average values obtained from the measurements covering nine years shows the dust fall of 23.04 g/sq m/month at Yahata-ku, 21.19 g/sq m/month at Tobata-ku, 21.39 g/sq m/month at Wakamatsu-ku, 14.53 g/sq m/month at Kokura-ku, and 14.43 g/sq m/month at Moji-ku; with sulfur oxides by use of PbO₂ method 0.619 mg/100 sq m/month at Yahata-ku, 1.045 mg/100 sq m/month at Tobata-ku, 1.011 mg/100 sq m/month at Wakamatsu-ku, 0.714 mg/100 sq m/month at Kokura-ku, and 0.637 mg/100 sq m/month at Moji-ku. Analysis of dust fall with respect to the type of area indicates a dust fall of 27.4 t/sq km/month in the industrial area, 18.35 t/sq km/month in the business area and 13.56 t/sq km/month in the residential area and with sulfur oxides of 1.060 mg/100 sq m/month, 0.745 mg/100 sq m/month, and 0.603 mg/100 sq m/month respectively. Analysis of the related diseases indicates that prevalences of chronic bronchitis, respiratory system disease, and eye diseases are found highest in the industrial area in accord with the level of atmospheric pollutants with some exceptions of bronchial asthma, nasal catarrh and lung cancer. In connection with lung cancer occurrences, 3,4-benzopyrene concentrations were also measured and tabulated.

APTIC-22537

EFFECT OF FLUORIDES ON MAN.

J. Air Pollution Control Assoc., 20 (9):615-616, Sept. 1970. 3 refs.

Harold C. Hodge.

Identifiers: *Subacute fluorosis, *Diagnosis, *Fluorine compounds, Bones, Digestive system, Respiratory system, Ingestion, Retention, Fluorosis, Primary metallurgical processing.

The transcript of a court case involving ingestion and inhalation of fluorine compounds from an aluminum factory is quoted to illustrate symptoms of subacute fluorosis. The symptoms reported include dyspepsia and thyroid enlargement. Subacute fluorosis, as described in the transcript, has recently been equated with the nonskeletal phase of fluorosis, which is characterized by symptoms relating to musculoskeletal, respiratory, and gastrointestinal symptoms. Typical of the disease is increasing general malaise and exhaustion leading to complete disability. As determined by other investigators, a relation appears to exist between the disease and fluoride exposure in patients living near a fertilizer factory and an iron foundry.

APTIC-22551

EFFECTS OF FLUORIDES ON MAN.

J. Air Pollution Control Assoc., 20 (9):614-615, Sept. 1970.

Victor A. Cecilioni.

Identifiers: *Toxicity, *Fluorosis, *Fluorides, Air quality criteria, Humans, Plant damage, Bones, Digestive system, Respiratory system, Toxic tolerances, Lung cancer.

Issue is taken with a recent report indicating the relative immunity of man to even high levels of fluoride air pollution. Among the misleading conclusions of the articles are the contention that, with few exceptions, the health of persons living near installations emitting fluoride dusts and fumes is not adversely affected and that 10 ppm of airborne fluorides will not damage vegetation. The fact is that some persons, like some species of vegetation, are more susceptible than others to elevated atmospheric fluoride levels. Considering that many species of plants are even more susceptible than man to the effects of fluorides, other countries have suggested that the maximum allowable fluoride air level be 1 ppb or less. There can be no doubt about the cumulative nature of fluoride effects in man or animals. While true osteosclerotic changes and even crippling fluorosis require many years exposure, 'neighborhood' fluorosis is known to produce early symptoms of fluorosis involving the musculoskeletal, gastrointestinal, and respiratory systems. The hazards of occupational exposure to fluoride are well documented, as evinced by a study of a fluorspar mine, where the average dust and fluoride concentrations were about 1 ppb. Among 53 deaths over a 10-yr period, 23 were due to pulmonary cancer, 29 times the average rate.

APTIC-22628

EFFECTS OF FLUORIDES ON MAN.

J. Air Pollution Control Assoc., 20 (9):614, Sept. 1970. 12 refs.

George L. Waldbott.

Identifiers: *Epidemiology, *Toxicity, *Air quality criteria, *Fluorides, Retention, Fluorosis.

The validity of recent air quality criteria for fluorides is questioned because the criteria were derived from standard epidemiological procedures rather than a careful evaluation of clinical data available on individual cases. It is emphasized that the adverse effects of air pollutants on man cannot be determined by epidemiological surveys. Disputed conclusions of the fluoride survey are that fluoride can be stored in soft tissue in high magnitudes and that urinary fluoride excretion is a reliable index of fluoride intake. With respect to the former, information is not yet available on the extent of functional damage to organs that have stored high values. With respect to the latter, urinary fluoride excretion varies widely from patient to patient. Other shortcomings of the survey were its failure to consider total fluoride intake and its exclusion of patients with chronic diseases and diseases known to affect the bone structure.

Lastly, the authors ignored the evidence that the Meuse Valley incident was due in large part to airborne fluoride.

APTIC-22629

DELTA-AMINOLEVULINIC ACID DEHYDRASE AS A MEASURE OF LEAD EXPOSURE.

Arch. Environ. Health, 21 (2):140-145, Aug. 1970.

21 refs.

Sven Hernberg, Jorma Nikkanen, Guy Mellin, and Helena Liljus.

Identifiers: *Delta-aminolevulinic acid dehydrase, *Diagnosis, *Metal poisoning, *Lead compounds, Blood chemistry, Urinalysis, Blood cells, Enzymes, Amino acids, Europe.

The concentration of lead in the blood is the most valid indicator of exposure to possible lead poisoning environments. Close negative correlation between the concentration of lead in blood (Pb-B) and the logarithm of erythrocyte delta-aminolevulinic acid dehydrase (ALA-D) was found for 159 persons with Pb-B levels ranging from 5 micrograms to 95 micrograms per 100 ml. A statistically significant correlation between Pb-B and delta-aminolevulinic acid (ALA) in urine was obtained only for Pb-B values over 50 microgram per 100 ml. These results indicate that erythrocyte ALAD is more accurate and more sensitive than ALA in urine as an indicator of the amount of circulating lead. ALAD assays can be used as a screening procedure to exclude a lead absorption over a given level. Fairly accurate estimates of the mean Pb-B of groups of people can also be made from their mean ALAD activity. (Author abstract modified)

APTIC-22637

SOME REMARKS ON AIR POLLUTION BY MOTOR EXHAUST AND OTHER COMBUSTION PRODUCTS.

For primary bibliographic entry see Field 01.

APTIC-22836

PULMONARY FUNCTION INVESTIGATIONS ON 1011 SCHOOL CHILDREN USING WRIGHT'S PEAK FLOW METER.

Scand. J. Clin. Lab. Invest., 25 (4):355-361, June 1970. 13 refs.

B. Juhl.

Identifiers: *Peak flow rate (pfr), *Children, *Pulmonary function, Age, Respiratory diseases, Europe, Flowmeters.

By means of Wright's Peak Flow Meter, the expiratory peak flow rate (PFR) was measured in 1011 school children aged 7 to 17 years. Of these, 779 had no objective signs or histories of disease in the respiratory organs. The normal biological variation of PFR in children was investigated for correlation to sex, age, height, and weight. For both sexes, the best common correlation was PFR equal to 5.10 times height in cm minus 425. The remainder of the children either had colds or had previously suffered from disease in the respiratory organs but were now symptom-free. This group had lower PFR values than the healthy children. (Author abstract)

APTIC-22855

FACTORY SMOKE CONTAINING MANGANESE AS CONTRIBUTING CAUSE IN PNEUMONIA EPIDEMICS IN AN INDUSTRIAL DISTRICT.

(Manganholdig fabrikk som medvirkende årsak ved pneumonia-epidemier i en industribygd.) Nord. Med., vol. 3:2527-2533, 1939. Translated from Norwegian. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 41p., Oct. 20, 1969.

Dagfinn Elstad.

Identifiers: *Silicosis, *Pneumonia, Humans, Morbidity, Mortality, Lungs, Europe, Industrial areas, Smokes, Manganese compounds, Silicon dioxide.

A discussion of an investigation relating pneumonia epidemics to factory smoke emissions containing manganese is presented. A relationship between the plant's production curve and a morbidity and mortality curve for pneumonia is derived. A study of the relationship of silicosis (from inhaling silicon dioxide) to the manganese factory yields uncertain results. The chemical and physical nature of the smoke is determined. Examinations of lung tissue from healthy individuals as compared with that from pneumonia-related deaths are presented. The presence of pneumococci in healthy persons ranges from 30% to over 60%, which indicates that the manganese may not be a primary cause of the pneumonia. A mechanism relating inhalation of manganese oxide to high morbidity/mortality is proposed. Results of similar investigations in other locations are included.

APTIC-22893

THE EFFECTS OF NOISE, AIR IONS, AND ELECTRIC FIELDS ON LIVING SYSTEMS.

Oklahoma Univ., Norman, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1968, 153p. 90 refs.

Adil M. Mayyasi.

Identifiers: *Behavioral aspects, *Rats, *Ions, *Electrical properties, Statistical analyses, Testing facilities.

Experimental animals (400 King-Holtzman hybrid breed of rats; 200 males, half young and half adult and 200 females, half young and half adult) were subjected to noise, negative air ions, and positive direct electric fields. One experiment involved exposing rats to two levels of noise and three levels of negative air ion concentrations; the other experiment involved exposing rats to two levels of noise and three levels of electric field intensity variations. Data collected consisted of the time and error scores (average value of 10 trials for each rat) of rats running a modified Lashley Left-Right Maze with an escape from water motive. A randomized-complete-block design with repeated measures was selected for statistical treatment by analysis of variance. In the cases where significant interaction terms appeared with significant main effects, an additional statistic (Newman-Keuls) was used to facilitate interpretation of the main effects. A new measure of learning based on the concept of negentropy as defined by information theory, and the concept of conservation of energy is exposed. Also, a random walk model for choice behavior which simulates the rat maze system is proposed. (Author abstract)

APTIC-22897

DIAGNOSIS AND THERAPY OF POISONING BY CHLORINATED HYDROCARBONS.

(Zur Diagnose und Therapie von Erkrankungen durch Chlorkohlenwasserstoffe). Text in German. Ther. Gegenw., 108 (1):54, 57-60, 62-64, 67-68, 70-71, 74, Jan. 1969. 4 refs.

Rudolf Winkler.
Identifiers: *Chlorinated hydrocarbons, *Toxicity, Diagnosis, Liver, Nervous system, Germany.

The acute toxicity of chlorinated hydrocarbons is governed by their volatility and by their specific toxicity. Chlorination increases both the narcotic and toxic properties of hydrocarbons. The various compounds of this category most often cause chronic intoxication: following resorption by the organism, they act as obvious protoplasmic poisons because they dissolve fats and lipids and thus affect the central and peripheral nervous system as well as the hepatic and renal parenchyma. Unspecific effects (vomiting, sweating, and palpitation) appear during exposure; specific effects appear later. The effect on the nervous system is due to the narcotic effect of the substances under review; that on the liver, to their destruction of mitochondria of liver cells. The properties, toxicity, and diagnosis of poisoning with methylene chloride, chloroform, carbon tetrachloride, dichloroethylene, 1,1,1-trichloroethylene, tetrachloroethane, pen-

tachloroethane, dichloroethylene, of trichloroethylene, and perchloroethylene are reviewed. First aid consists of decontamination, the maintenance of respiration, and prevention of additional damage. Medical treatment involves the maintenance of respiration and of circulation, the counteracting of central nervous system manifestations, the prevention of hepatic and of renal insufficiency, and the prevention of secondary infections. In cases of acute poisoning, the immediate administration of 120 ml paraffin oil is indicated. Prophylactic measures are reviewed.

APTIC-22902

ORGANIZED TRANSFERS OF MINERS AS PRECAUTION IN CONTROL OF PNEUMOCONIOSIS.

Pracovní Lekar. (Prague), 19 (2):74-78, 1967. Translated from Czech by J. Chapin, National Institutes of Health, Bethesda, Md., Translating Unit, 10p., July 10, 1969.

Bedrich Mautner.

Identifiers: *Mining, *Occupational health, *Pneumoconiosis, Legislation, Age, Males, Lungs, Czechoslovakia, Dusts, Coal, Particulate sampling, Source sampling.

Experiences in the organized replacement of miners to control pneumoconiosis in the Ostrava-Karvina region are presented. The mine workplaces are classified by law into four hazard categories according to the hygienic conditions and results of dust concentration measurements. The dust rate is estimated gravimetrically by sampling on Soxhlet filters. To prevent aggravation of pneumoconiosis, the organized replacement to less hazardous areas is carried out when the disease is revealed. This replacement is also effected in the case of healthy miners, to prevent the development of the disease. These cases concern workers younger than 21 years who have exceeded the maximum exposure time and workers with X-rays corresponding to group Z of the international classification of pneumoconiosis. The maximum exposure time, after which the miner should be transferred, is determined in each plant according to the hazards of the mine and the pneumoconiosis rate. It is expected that the preventive replacement of miners will reduce the rate of new diseases and reduce aggravations of existing pneumoconiosis cases. (Author summary modified)

APTIC-22953

RELATIONSHIP BETWEEN THE TYPE OF WORKPLACE AND OCCUPATION AND THE DEVELOPMENT OF PNEUMOCONIOSIS IN COAL MINERS.

Pracovní Lekar. (Prague), 19 (4):159-163, 19 refs. Translated from Czech by J. Chapin, National Institutes of Health, Bethesda, Md., Translating Unit, 10p., July 9, 1969.

J. Rosmanith, and C. Losert.

Identifiers: *Occupational health, *Pneumoconiosis, *Mining, Age, Males, Lungs, Czechoslovakia, Dusts, Coal, Statistical analyses.

The rate of pneumoconiosis development, in relation to the type of work-place and occupation, was observed in 1132 coal miners up to 6 to 10 years after the initial form of the disease appeared. The rate of development was quickest in the miners engaged in the actual mining of coal, slower among the cutters, and slowest among those whose work alternated between mining and cutting. To retard the development of pneumoconiosis, work in the mines must be stopped after a finding of reticulosis. If the miner stops working in the mines only after a diagnosis of general nodulation, further development of the disease will not be prevented. The more advanced the stage of pneumoconiosis at the time of transfer, the higher is the frequency of the complicated form of the disease. No relationship was found between age and pneumoconiosis development. The prevention of pneumoconiosis among miners requires a transfer from the most hazardous occupations before the reticulosis diagnosis is made. (Author conclusions modified)

APTIC-22962

OZONE AND VITAMIN E.

Science, 169 (3945):605-606, Aug. 7, 1970. 11 refs. Bernard D. Goldstein, Ramon D. Buckley, Ramon Cardenas, and Oscar J. Balchun.

Identifiers: *Ozone, *Vitamin e, *Toxicity, Rats, Lipids, Pulmonary edema, Chemical reactions.

Two groups of 16 rats were divided, respectively, into eight who received a vitamin E-deficient diet and eight who received a normal diet. When the first group of 16 was simultaneously exposed to 10.4 ppm ozone, the eight vitamin E-deficient rats died of pulmonary edema after 360 to 410 min of exposure. The controls survived 440 min of exposure. Similar results were obtained for the second group of 16: all vitamin E-deficient rats died 240 to 310 min after exposure to 14.0 ppm ozone, while controls survived 315 to 405 min. In a related experiment, measured alpha tocopherol concentrations in serum after exposure to 3.5 ppm ozone were lower in vitamin E-deficient rats than rats fed a standard diet. These findings are consistent with the possibility that lipid peroxidation is a mechanism of ozone toxicity.

APTIC-22979

FREQUENCIES OF COMPLAINTS OF RESPIRATORY DISEASES IN AIR POLLUTED AREA.

(Taiki ozen chiku ni okeru kokyukishojo chosa. I. Tsukumi-shi no baai). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4 (1):49, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.) Ryoichi Yano, Ichiro Hata, and Toshiro Nakajima.

Identifiers: *Questionnaires, *Respiratory diseases, *Dusts, Children, Age, Pulmonary function, Asthma, Bronchitis, Cough, Pneumonia, Japan, Cements, Stone, Industrial areas, Residential areas, Statistical analyses.

Tsukumi is a town devoted to the production of limestone and cement, and the people complain much about the white dusts that rise from the factories. Oita Prefecture Medical Assoc. and Tsukumi Medical Assoc. conducted a city-wide questionnaire survey of kindergarten, grammar school and junior high school pupils concerning the respiratory afflictions caused by dust particles. The samples were drawn from industrial and residential areas. Examination of the individual with regard to the history of pneumonia and bronchitis showed that people in the industrial area are more prone to respiratory illness and the morbidity is higher, the lower the age. Other investigations including radiography and breathing test indicated that compared to the results obtained from other non-polluted areas, there are slightly more respiratory ailments among pupils in Tsukumi, but not at a statistically significant level.

APTIC-22990

THE INFLUENCE OF AIR POLLUTION BY FLUORIDE ON HUMAN HEALTH.

(Fukkubutsu ni yoru taiki ozen to ningen no kenko). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6 (8):577-582, Aug. 15, 1970. 25 refs.

Fumio Tsunoda.

Identifiers: *Epidemiology, *Occupational health, *Toxic tolerances, *Fluorides, Humans, Respiratory system, Nostrils, Sinuses, Skin, Respiratory functions, Pulmonary function, Eye irritation, Aluminum, Japan, Primary metallurgical processing, Statistical analyses.

The health condition of employees under the influence of atmospheric fluoride in an aluminum refinery and the health condition of neighboring residents under the influence of contaminated air from the refinery were surveyed from the viewpoint of epidemiology and clinical toxicology. The people living in the fluoride-bearing atmosphere did not have clear subjective symptoms as to skin

and mucous troubles when the fluoride level was between 1.0 and 1.9 ppm. This is quite contrary to the effects of other stimulative gaseous substances like SO₂ which is particularly irritating to olfactory organs and skin. Fluoride concentration between 1.0 and 1.9 ppm may cause light obstructive trouble to the pulmonary function but not seriously. The investigation of atmospheric H₂ variation and of both tooth spot trouble and osteomalacia, which are representative of chronic fluoride poisoning, has indicated that daily exposure to fluoride-bearing air did not provide any conclusive evidence as to its effect on health as long as the concentration remains between 1.0 and 1.9 ppm. Some dubious aspects in view of clinical toxicology are presented, however. As in the case of the influence of excessive fluoride intake through agricultural products, the direct effect of atmospheric fluoride on respiratory organs is a subject still to be studied.

APTIC-23003

EPIDEMIC OF MERCURY POISONING IN THE AGANO RIVER AREA. AN INTRODUCTORY REVIEW.

Keio J. Med., vol. 18:213-227, 1969. 10 refs.
Kenzaburo Tsuchiya.

Identifiers: *Metal poisoning, *Mercury compounds, Humans, Adults, Epidemiology, Hematology, Occupational health, Urinalysis, Skin, Toxicity, Japan, Rivers, Water pollution, Organometallics.

A review is given of the established data and of several hypotheses relating to the epidemic of methyl mercury poisoning which affected 26 humans as well as large numbers of domestic animals in the Agano River delta, Niigata Prefecture, Japan. The outbreak started in 1964 and ended in July 1965. Most of the affected group, which included three females, were fishermen or a member of a fishermen's family. Data on mercury concentrations in hair, urine, and blood are given and the biological complex of humans, fish and environmental factors is considered. Evidence indicates that fishermen, who only live near the river mouth, were the victims because they eat one kind of fish which cannot usually be marketed due to its boniness. In fish with higher concentrations of mercury, the mercury compound was most likely to be the agent of poisoning was methyl mercury rather than inorganic mercury. Various hypotheses as to the source of the methyl mercury are critically reviewed. These theories relate to an earthquake that occurred several months before the epidemic, to two acetaldehyde factories located along the river which supposedly discharge mercury into it, and to possible washout from pesticides. It is concluded that the source cannot be definitely established in the case of this particular epidemic.

APTIC-23012

INDUSTRIAL MANGANESE POISONING.

National Inst. of Health, Washington, D. C., Div. of Industrial Hygiene, Bull. 182, 1943, 24p. 201 refs.

Lawrence T. Fairhall, and Paul A. Neal.
Identifiers: *Manganese compounds, *Occupational health, *Metal poisoning, Humans, Morbidity, Pathological techniques, Treatment and aids, Diagnosis, Toxicity, Toxic tolerances, Industrial emission sources, Control methods.

After a brief review of the occurrence and uses of manganese, its physical-chemical properties, and of the industries offering exposure to manganese, the toxicology of the element is elaborated. Cases of industrial and experimental poisoning cited in the literature are noted. Symptoms of known manganese poisoning are cited, and the pathology of chronic industrial manganese poisoning in man is elucidated. The difficulty of diagnosing the poisoning through laboratory examinations is stressed. From a study of the course of cases of chronic manganese poisoning, it is concluded that many of its symptoms will disappear or regress if a

worker is removed from exposure after the onset of symptoms. Well-established manganese poisoning is, however, a crippling disease, particularly with regard to the use of the legs. Prevention of chronic poisoning can be accomplished by use of effective control measures which prevent inhalation and ingestion of manganese compounds. Enclosed processes, mechanical conveyors, and exhaust ventilation should prove useful in control. Periodic medical inspection of workers is also suggested.

APTIC-23028

LEAD POISONING. AN OLD PROBLEM WITH A NEW DIMENSION.

In: Essays in Toxicology. F. R. Blood (ed.), Vol. 1, New York, Academic Press, 1969, Chapt. 4, p. 115-155. 92 refs.

P. B. Hammond.
Identifiers: *Metal poisoning, *Lead compounds, Laboratory animals, Infants, Blood gas analysis, Bones, Circulatory system, Kidneys, Nervous system, Metabolism, Toxicity, Engine exhausts, Fuel additives, Tetraethyl lead.

Sources and uses of lead, the metabolism of lead, its toxic effects, environment and the body burden, and the evaluation of blood levels are reviewed. Common forms of lead poisoning result from the mining, processing, and commercial dissemination of lead. The amount of lead produced annually in the United States is more than one million tons. Tetraethyl lead represented roughly 20% of U. S. lead consumption in 1966, while it is estimated that 70-80% of the TEL in motor fuel is eventually exhausted into the atmosphere to be either inhaled directly or deposited on vegetation, soil, and water. Much of the lead retained is probably actually swallowed, although it also can be absorbed through the gastro-intestinal tract. X-ray diffraction studies have suggested that lead assumes position within the bone crystal, either by ion exchange or by occupation of lattice interstices. At extremely low concentrations, lead is an effective nucleating agent for inducing the formation of calcium phosphate crystals; this property may serve to trap lead at the surfaces of bone crystals and it may be important in pathological processes of soft tissue calcification. More than 95% of the lead circulating in the blood is associated with erythrocytes, and the remaining is in the plasma. Long-term exposure to lead is potentially hazardous at some daily level of intake far below the acute toxic dose. Mortality and the incidence of lead poisoning in infants is much higher during the summer months than it is during the rest of the year. Exposure to light, particularly in the ultraviolet range, increases the excretion of coproporphyrin in the rabbit following administration of lead. The effects of lead are discussed on the hemopoietic system, on the central and peripheral nervous system, and on the kidneys. The minimum blood concentration of lead below which it is most unlikely that poisoning will ever occur is 0.08/100 gm blood. Lead poisoning in infants, domesticated animals and wildlife, is also discussed.

APTIC-23058

SOME BIOLOGICAL EFFECTS OF RADIATION IN RELATION TO OTHER ENVIRONMENTAL AGENTS.

California Univ., Livermore, Biomedical Div., and Atomic Energy Commission, Washington, D. C., Proc. Symp. Biol. Implications Nuclear Age, Livermore, Calif., 1969, p. 223-230. 9 refs. (March 5-7.) CFSTI: CONF-690303

Norton Nelson.
Identifiers: *Diseases and disorders, *Radioactive radiation, Age, Enzymes, Hormones, Cell growth, Smoking, Synergism, Cancer, Lung cancer, Carcinogens, Mutations, Tumors.

The interactions between ionizing radiations and other environmental agents in causing hazards to man are not yet subject to orderly and quantitative presentation. The compartmentalization of

research and set standards on different environmental hazards should be eliminated, lest we fail to recognize important and possibly synergistic interactions. Responses to radiation are interdependent with age, hormonal status, and other factors. Enzymatic processes, which may be involved in defense against drugs or toxic compounds, can be affected by radiation exposure. Possible additive or synergistic effects of radiation and chemical mutagens in producing genetic or somatic mutations are little understood. Activation of latent viruses, which then produce tumors, can be evoked by either radiation or chemical agents. Carcinogenesis by radiation or chemical agents presumably comes about via similar pathways. The statistical outcome in tumor incidence may show either additivity of radiation and chemical effects or, perhaps, a synergistic action. The first reasonably clear demonstration in man of interaction between radiation and a chemical carcinogen (tobacco) is seen in an enhancement of lung cancer incidence in uranium miners who smoke cigarettes. (Author abstract modified)

APTIC-23059

PARTICULATES - PROPERTIES AND CHARACTERISTICS.

Preprint, National Air Pollution Control Administration, Washington, D. C., Bureau of Abatement and Control, Bp., 1970. 1 ref.

(Presented at the Pollution Conference, 3rd, Cleveland State University, Ohio, May 13, 1970.) Robert L. Harris Jr.

Identifiers: *Dusts, *Deposition, *Lung clearance, Humans, Cilia, Bronchi, Alveoli, Trachea, Health impairment, Particle size.

Relationships between dust hazards and health are reviewed by considering the nature of dust and the way the respiratory system copes with dust particles which are inhaled. The effect of particle size on particle aerodynamics and on deposition in the lung is discussed. The distribution of particles by size is considered in the trachea, bronchial tubes, lungs, and alveoli. Clearance mechanisms of the body, primarily ciliary action, are described. Clearance efficiency, normally about 99%, appears to decrease with increasing dust burdens.

APTIC-23078

EXPERIMENTAL STUDIES ON AEROSOL DEPOSITION IN THE HUMAN RESPIRATORY SYSTEM. (REP. 4).

(Erosoru no kokuyukido chinchaku ni kansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4 (1):66, 1969. (Proceedings of the Japan Society of Air Pollution 10th. Annual Meeting 1969.)

Toyohiko Miura, and Kikuji Kimura.

Identifiers: *Respiratory system, *Deposition, *Aerosols, Humans, Adults, Males, Pathological techniques, Breathing, Japan, Particle size, Styrenes, Toluene, Flow rates.

Polystyrene and polyvinyltoluene aerosols ranging in sizes 0.109, 0.500, 1.090 micron and 1.837 micron, respectively were breathed in by three adult men for the measurement of the rate of deposition of aerosols in the bronchial tubes. Essentially the deposition rate is the expression in % of one minus the ratio of aerosol concentrations in expired and inspired air. Personal differences were noted in the deposition rates, and 0.109 micron particles had a higher rate than 0.500 micron particles, probably because of the diffusion effect. The deposition rate also has been considered to depend on breathing frequency, but it apparently depends more on the tidal volume. Also, although the breathing volumes are approximately equal, there are personal differences regarding the relationships between the breathing frequencies and the tidal volumes. Finally even under the same aerosol concentration and doing the same physical work, workers differ in the deposition rate because of the relationship between the breathing volume and the tidal volume.

APTIC-23099

STUDIES OF CHRONIC SO EXPOSURE OF INHABITANTS IN OSAKA OBSERVED THROUGH CO CONCENTRATIONS IN EXPIRED ALVEOLAR AIR. PART II. DIFFERENCES OF EXPIRED CO CONCENTRATIONS OF SCHOOLCHILDREN BETWEEN SOME AREAS POLLUTED AND NON-POLLUTED BY AUTOMOTIVE EXHAUST.

(Kokichu CO nodo kara mita CO mansei bakuro no jittai ni kansuru kenkyu. 2. Shinai chikibetsu ni mita gakudo no kokichu CO nodo no hikaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4 (1):64, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

Hiroshi Watanabe, Kinuko Tomita, Toshio Kawaraya, and Takahiro Haruki. Identifiers: *Carbon monoxide, *Osaka, *Children, *Breathing, Seasonal, Lungs, Japan, Commercial areas, Residential areas, Sampling methods, Field tests.

Considering the carbon monoxide (CO) concentration in expired air as an index of CO contamination, school children living in fixed areas in Osaka were examined for the effects of CO contamination. Seven schools were chosen from the locations in the central commercial area (polluted) and other residential areas (non-polluted). The studies were conducted in spring, autumn and winter. Since the children have small lung capacity, only half of the expired air was collected in a PVC bag. Before and after the samplings, air in playgrounds was also collected. The samples were all tested for CO. Throughout the whole study, children in two schools in the CO pollution area showed the maximum values ranging from 4.5 to 5.5 ppm. Also for the school situated in front of Osaka Station which is in the polluted area, the student values were between 2.8 and 3.1 ppm, and did not show any seasonal variation. For school children in the non-polluted area, the values ranged from 2.0 to 2.8 ppm and also were seasonally invariant. Another group of school children in the non-polluted area in winter had values 4.7 to 5.4 ppm, similar to those of the polluted area, apparently because of the effects of the gas stoves for heating. APTIC-23100

CHRONIC DISEASES OF RESPIRATORY SYSTEM IN THE AIR POLLUTED AREA OF KAWASAKI CITY.

(Kawasaki shi no taikiosen chiku ni oleru manseikokuyuki shikkan chosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4 (1):46, 1969. (Proceedings of the Japan Society of Air Pollution 10th, Annual Meeting, 1969.) Ryohai Tokuda, and Taku Hashimoto.

Identifiers: *Chronic, *Eye irritation, *Respiratory diseases, *Bronchitis, *Kawasaki city, Questionnaires, Humans, Adults, Age, Bioclimatology, Epidemiology, Hematology, Diagnosis, Eyes, Bronchi, Lungs, Nostrils, Pulmonary function, Asthma, Laryngitis, Tuberculosis, Japan, Urban areas, Industrial areas, Residential areas, Sulfur dioxide, X-rays.

Kawasaki has about 38 industrial establishments that produce much sulfur dioxide emission, and most of them are situated along the southeastern sea coast. This area was defined as a high-pollution area, and the rest of the city was divided into intermediate, light and non-polluted sectors. Out of the population of about nine million, 300,000 live in the high-pollution area. In a series of preliminary investigations a sample of 1000 citizens was questioned concerning respiratory duct and lung afflictions as well as eye and nose irritations. They were also investigated for past histories of chronic bronchitis. Of the high-pollution area residents 95% showed an affliction of one sort or another. Similar investigations were conducted on daily laborers, and the results were similar. In addition chest X-rays were given to the elderly, and 10% of them from the high-pollution area had an active case of TB which is five times more than in the non-polluted area. Other preliminary tests led to the conclusion that chronic respiratory diseases among the high-pollution area

residents are not negligible, and for these patients, pulmonary function test, chest X-ray, EKG, blood test, and British Medical Research Council questionnaire were administered and the results are presently being analyzed.

APTIC-23101

RELATIONSHIPS BETWEEN AIR POLLUTION AND RESPIRATORY DISEASES. PART II. STUDIES ON THE OBSTRUCTIVE PULMONARY DISEASES IN THREE CITIES OF UBE, TOKUYAMA AND ANAYO.

(Taiki osen to kodyukikei shikkan. Dainiho. Ube, Tokuyama, Nanyo santoshimin no heisokusei haishikkan). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4 (1):47, 1969. (Proceedings of the Japan Society of Air Pollution 10th, Annual Meeting, 1969.)

Yoshimasa Nose, Kazuko Yoshizaki, Junichi Mise, Yoshimitsu Nose, and Takaaki Sakurai. Identifiers: *Ube, *Tokuyama, *Nanyo, *Bioclimatology, *Morbidity, *Mortality, Questionnaires, Humans, Adults, Epidemiology, Diagnosis, Compliance, Ventilation (pulmonary), Cardiovascular diseases, Asthma, Bronchitis, Pneumonia, Japan, Urban areas, Dusts, Air quality measurements, Dust fall, Sulfur dioxide.

A table showing the percentage death rate due to bronchitis/asthma, pneumonia and heart disease for the periods 1960-61 and 1962-63 for three age brackets over 40 indicates that the increase in sulfur dioxide in Ube since 1962 had been accompanied by an increase in death rate due to bronchitis and asthma. A random sampling of 3000 patients of the Internal Medicine Division of the Yamaguchi University Medical School revealed that since 1962 the number of non-tuberculosis type respiratory disease cases has increased rapidly. The percentage increases were 3.0% in 1960 and 4.1% in 1963. The average annual concentrations of settling dust particles and sulfur dioxide in the atmosphere are tabulated over three recent years for Tokuyama, Nanyo and Ube. In Tokuyama and Nanyo, by using the British Medicine Research Council method, questionnaire surveys were conducted, and subsequently more precise physical examinations were performed. Precise data are tabulated, and respiratory disease cases requiring hospitalization are listed by sex, %VC, %MBC and FEV 1.0/EVC. APTIC-23102

ASSOCIATION OF AIR POLLUTION TO THE RESPIRATORY SYMPTOMS IN ISOGO-KU, YOKOHAMA. PART II. PREVALENCE OF RESPIRATORY SYMPTOMS, 1967.

(Yokohama-shi Isogo-ku ni okeru taikiosen no kokuyuki ni oyobosu eikyo. dai nihou. Kokuyuki shoho no yusoryitsu. showa 42-nen do). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 16 (14):891-905, Nov. 15, 1969. Namikichi Imai, Kazuo Abe, Mamoru Asukata, and Atsushi Otani.

Identifiers: *Questionnaires, *Respiratory diseases, *Yokohama, *Air quality measurements, Humans, Adults, Children, Hematology, Diagnosis, Urinalysis, Respiratory system, Pulmonary function, Japan, Dusts, Sulfur dioxide, X-rays.

Results from a medical survey conducted in October 1967 are reported. In 1966 a previous survey was made in the same area by use of the same method based on 'Short Questionnaire on Respiratory Symptoms' designed by the British Medical Research Council. Two hundred forty nine males and 323 females over forty years old, sampled at random in Isogo-ku, were asked to undergo several tests such as a personal interview using the short questionnaire, primary pulmonary function test, chest X-ray, blood pressure measurement, and urinalysis. The annual average levels of the major atmospheric pollutants of the area in 1967 were recorded. Sulfur dioxide measured 0.92 mg/100 sq m/day compared to 0.68 mg/100 sq m/day in 1966 and dust fall measured 8.3 t/sq km/month in 1967 as against 7.8 t/sq km/month in

1966. The prevalence of respiratory symptoms and values obtained from the pulmonary function tests were nearly same as those of the former test. The frequency of chronic coughing symptoms and phlegm, was found to be 3.2%. The results and data are elaborately tabulated. The 1967 survey is claimed to be more accurate and is more reliable owing to more deliberate preparations, and, as was initially intended, it will serve as a proper basis for comparison with other similar studies of medical nature concerned with relationships between air pollution and respiratory symptoms. APTIC-23104

THE EFFECT OF CARBON MONOXIDE ON THE VISUAL EVOKED RESPONSE IN MAN.

Arch. Environ. Health, 21 (2):174-180, Aug. 1970. 12 refs.

Michael J. Hosko.

Identifiers: *Carbon monoxide, *Visual evoked response, *Electroencephalography, Adults, Age, Males, Carboxyhemoglobin, Diagnosis, Nervous system.

In a series of experimental human exposures to carbon monoxide, the visual evoked response and spontaneous electroencephalogram were monitored and correlated with the magnitude of exposure to ascertain whether these measures of cerebral activity are effected by CO. Twelve healthy male graduate students and two medical school faculty ranging in ages from 24 to 42 years were exposed to CO at concentrations ranging from 1 to 1000 ppm for 0.50 to 24 hours. Carboxyhemoglobin levels greater than 20% produced changes in the visual evoked response similar to those previously described in animals. The amplitude of the 2-3-4 wave complex was increased and accompanied by a negative-going shift in the 5a-6 waves. COHb levels approaching 33% did not alter gross spontaneous electroencephalographic activity. (Author abstract modified) APTIC-23133

OCCUPATIONAL EXPOSURE TO CARBON MONOXIDE IN DOWNTOWN TRAFFIC. A PILOT STUDY.

(Pilot-study zur beruflichen Kohlenmonoxid-Gefahrung in Grossstadtstrassen). Text in German. Arbeitsmedizin, 26 (3):224-230, 1970. 22 refs.

D. Szadkowski, V. Mastall, K.-H. Schaller, and G. Lehnert.

Identifiers: *Carboxyhemoglobin, *Occupational health, *Carbon monoxide, Smoking, Germany, Streets, Urban areas, Automotive emissions.

Since gasoline-driven cars are the major source of carbon monoxide emissions, atmospheric CO concentrations increase where traffic flow is heaviest in a city. In a pilot study conducted in a large German city, hemoglobin and carbon monoxide hemoglobin levels were measured in 138 dustmen and scavengers exposed to heavy traffic for eight hrs per day. Carbon monoxide hemoglobin levels (mean 4.04%, sd 2.82%) in the workers were not high enough to cause intoxication, nor significantly different from levels reported in the literature for persons not occupationally exposed to CO. However, there are distinct differences between carbon monoxide hemoglobin levels in smokers and nonsmokers. APTIC-23138

ABSORPTION AND ELIMINATION OF CARBON MONOXIDE BY INACTIVE YOUNG MEN.

Arch. Environ. Health, 21 (2):165-171, Aug. 1970. 11 refs.

Jack E. Peterson, and Richard D. Stewart.

Identifiers: *Carboxyhemoglobin, *Absorption, *Carbon monoxide, Adults, Males.

Human volunteers were exposed to carbon monoxide at concentrations of less than 1, 25, 50, 100, 200, 500, and 1000 ppm for periods of one-half to 24 hours. Blood samples for carboxy-

hemoglobin were obtained during the exposures and for up to 23 hours into the post-exposure periods. Post-exposure treatment with oxygen at 1.0 and 3.0 atmospheres was included. Eighteen healthy male students and medical school faculty ranging in age from 24 to 42 years volunteered for the exposure studies. Carbon monoxide was continuously metered into the chamber, and chamber temperature and humidity were controlled with a recirculating window air-conditioning unit. Concentrations of CO and the chamber atmosphere were monitored by an infrared spectrophotometer and a gas chromatograph equipped with a helium ionization detector. Several model equations were tested against the absorption and excretion data; one theoretical equation accurately predicted COHb levels resulting from continuous and discontinuous exposures to unvarying concentrations and from continuous exposures to a steadily rising concentration. Excretion or elimination of CO from the blood was a 'half-life' phenomenon. In 39 separate experiments, the half-life of COHb in the blood ranged from 128 to 409 minutes, with an average of 320 minutes. (Author abstract modified)
APTIC-23142

ON THE YEARLY ANALOGY OF AIR POLLUTION BETWEEN UBE-ONODA REGION AND TOKUYAMA-NANYO REGION.

(Ube-Onoda chiku to Tokuyama-Nanyo chiku no taiki oson no tsuinen no ruijika ni tsuite). Text in Japanese. Yamaguchi Idoi Sangyo Igaku Kenkyusho Nenpo (Ann. Report Res. Inst. Ind. Med., Yamaguchi Med. School), no. 16:217-220, 1969. 5 refs.

Yoshikatsu Nose, and Nobuko Tokojima. Identifiers: *Chronic, *Bronchitis, *Settling particles, *Ph, Humans, Epidemiology, Morbidity, Cements, Japan, Combustion products, Dusts, Coal, Fuel oils, Mineral processing, Mining, Petroleum production, Winds, Sulfur dioxide, Ph.

Mining-industrial cities Ube and Onoda are known as the cities of dust pollution, and Tokuyama and Nanyo of the petrochemical industry are polluted by gaseous pollutants. However, the recent trend in the soluble and non-soluble components of the pollutants, the seasonal wind direction, the decline in the use of coal in Ube and Onoda, and the general tendency in the industry to use more and more petroleum, have all contributed toward the increasing similarity in the nature of pollution in the two groups of cities. In addition, the similarity of the rates of chronic bronchitis affliction in the two general areas indicate that it is related to the similarity of the proportions of soluble components in the settling dusts, especially the pH values, in Ube and Nanyo, and Tokuyama and Onoda. This can be seen in the regression line of the bronchitis affliction rate versus the pH of soluble components, the data points being taken from all four cities and other major bronchitis-prone cities as Yokkaichi and London.
APTIC-23148

RELATIONSHIP BETWEEN PROPERTIES OF AIR POLLUTION AND CHRONIC BRONCHITIS AND ASTHMA AS WELL.

(Taiki oson no seijo to mansei kikanshien narabini kikanshizensoku to no kanrensei). Text in Japanese. Yamaguchi Idoi Sangyo Igaku Kenkyusho Nenpo (Ann. Report Res. Inst. Ind. Med., Yamaguchi Med. School), no. 16:13-30, 1969. 74 refs.

Yoshikatsu Nose. Identifiers: *Asthma, *Bronchitis, *Stack gases, *Dusts, *Sulfur dioxide, Humans, Morbidity, Japan, Industrial areas, Coal, Fuel oils, Air quality measurements, Statistical analyses, Ph.

The relationship between air pollution and respiratory diseases in the industrial cities of Yamaguchi Prefecture was investigated. The general nature of air pollution has been changing from settling dusts to gases from the combustion of fossil fuels, and correspondingly, the relative predominance of as-

sociated diseases have changed from bronchitis to asthma. In three cities, Ube, Onoda, and Mine (settling dusts), the frequency of bronchitis was higher than in Tokuyama and Nanyo (gaseous pollutants). The frequency of asthma was more or less the same for both groups of cities, but in the gaseous pollution cities, in the areas where both dusts and gases are becoming more concentrated, the frequency of asthma is increasing. The higher concentration of sulfur dioxide seems to be associated with the increase in the asthma affliction rate. Also, there was a significant negative correlation between the frequency of bronchitis and the soluble components such as SO₃ and Cl in settling dusts as well as their pH. Various data on air pollution such as are caused by settling dusts and gases, and bronchitis and asthma are tabulated and statistical analyses of data are presented.
APTIC-23151

THE HAZARDS OF TRACE ELEMENTS.

Sci. News, 97 (23):560-561, June 6, 1970.

Richard H. Gillyly.

Identifiers: *Metal poisoning, Mice, Rats, Mortality, Kidneys, Nervous system, Cardiovascular diseases, Bronchitis, Emphysema, Incineration, Internal combustion engines, Absorption, Carbon-yls, Cadmium compounds, Lead compounds, Nickel compounds, Vanadium compounds.

When researchers at a metal-free laboratory at Brattleboro, Vt., exposed rats and mice orally over their lifetimes to environmental amounts of all the elements found in the National Air Sampling Stations, three elements appeared of concern in the amounts found in the environment: lead, nickel, and cadmium. In doses comparable to amounts that might accumulate in humans living near dense traffic, lead shortened life spans of the experimental animals and caused nervous system deterioration. Nickel carbonyl results from a reaction between nickel and hot carbon monoxide which probably takes place in incinerators and in internal combustion engines. It is absorbed by the lungs and is probably carcinogenic. Inhaled, cadmium can cause emphysema and bronchitis. Taken into the body, through the lungs or otherwise, it is associated with cardiovascular death rates, hypertension, and kidney disease. Vanadium alone is nontoxic in laboratory animals in amounts far larger than found in the environment, but it may facilitate creation of enough sulfur trioxide to cause problems. However, adequate chromium in the diets of experimental rats will prevent the toxic effects of lead. An approach that has been suggested to deal with trace elements in water supplies is to create dual water-supply systems, one system for industrial uses and residential uses and the second for drinking water.
APTIC-23167

THE CUMULATION DYNAMICS IN SOME TISSUE OF HAIRLESS MICE INHALING ARSENIC.

Atmos. Environ., 4 (2):157-161, 1970. 25 refs.

V. Bencko, and K. Symon. Identifiers: *Mice, *Tissues, *Breathing, *Arsenic compounds, Liver, Kidneys, Skin, Retention, Czechoslovakia, Aerosols, Exposure chambers.

An experiment is described in which hairless mice inhaled arsenic in the form of a solid aerosol from fly ash of particle size less than 10 micron containing 1% arsenic in the form of white arsenic. The mice were placed in a dust chamber for 5 days per week for 6 hr daily over a period of 6 weeks, and the control group was handled in a similar manner without the aerosol application. Cumulative dynamics of arsenic in the liver, kidney, and skin were studied. After an initial increase of arsenic values at the given exposure (mean arsenic concentration in air, 179.4 micrograms inverse cu m), a rapid decrease in the arsenic values in the liver and kidney occurred in the period between the 2nd and 4th week of exposure. The smaller observed decrease of arsenic values in the skin of the exposed animals may be due to direct exposure to

dust and the possibility of direct absorption. The course of arsenic cumulation when inhaled is concluded to be similar to peroral application. (Author abstract)
APTIC-23168

CHRONIC MANGANESE POISONING IN AN ORE-CRUSHING MILL.

National Institutes of Health, Bethesda, Md., Div. of Industrial Hygiene, PHS Bull. 247, 77p., 1940. 43 refs.

Robert H. Flinn, Paul A. Neal, Warren H. Reinhart, J. M. Dallavalle, and William B. Fulton. Identifiers: *Manganese compounds, *Hematology, *Metal poisoning, *Manganese compounds, *Occupational health, Adults, Males, Pathological techniques, Urinalysis, Nervous system, Manganese, Primary metallurgical processing.

The occurrence of chronic manganese poisoning among the 34 employees of a manganese ore-crushing mill varied with the atmospheric manganese concentration and with the length of employment. Eleven cases were found. None of the 9 men exposed to less than 30 mg of manganese per cubic meter had the disease, although only 2 of these 9 men had been employed more than 3 years; on the other hand, 5 of the 6 men exposed for more than 3 years to atmospheric manganese concentrations exceeding 90 mg per cubic meter had the disease. Tests made in a modern mill showed that the workers exposure could be reduced to at most 6 mg per cubic meter by the use of enclosed machinery, mechanical conveyors, and exhaust ventilation. The disease is characterized by muscular stiffness and incoordination which progresses until disability results. The worker often complains of extreme drowsiness, weakness or lassitude, muscular twitchings and cramps, and difficulty in walking or talking. Manganese-affected workers had low leukocyte counts, particularly in neutrophilic cells, and in Lange's test the middle range of dilutions of cerebrospinal fluid gave slightly positive reactions. Differential diagnosis of the disease and laboratory and autopsy findings are discussed, and recommendations for medical and engineering control are given. Control at the onset is urgent, since disability from advanced stages of manganese poisoning is permanent. (Author abstract modified)
APTIC-23200

STUDIES ON THE RELATIONSHIP BETWEEN AEROGENIC MOLDS AND BRONCHIAL ASTHMA IN CHILDHOOD. PART II. MOLD SURVEY OF OUTSIDE AIR IN TOKYO AREA HAS BEEN DONE FROM JULY 1959 TO AUGUST 1961. MEHRICH'S MEDIUM WAS USED FOR CULTURE.

(Shonikanshizensoku to kuchushinkinru to no kankai ni kansuru kenkyu: daiinben tokyo chiku ni okeru kuchushinkinru no kisetsutekishocho ni tsuite). Text in Japanese. Arerugi (Japanese J. of Allergy), 14 (3): 158-64, 1965. 11 refs.

Yoshio Sannomiya. Identifiers: *Asthma, *Microorganisms, Seasonal, Children, Skin tests, Bronchi, Cell growth, Allergies, Tokyo, Microorganisms.

Aerogenic molds in the Tokyo area were cultivated by using a modified Mehrlich's medium. The majority of the molds found regardless of the time of year were *Penicillium*, *Aspergillus*, and *Hormodendrum*, while the others found were *Macrosporium*, *Alternaria*, *Monilia*, *Rhizopus*, *Tohuia*, *Streptomyces*, *Trichoderma*, *Fusarium* and *Saccharomyces*. Total mold spore counts revealed an increase generally in the hot season (June, July, August and September), and a decrease in the cold season (January, February and March). *Penicillium* and *Aspergillus* increased in summer and fall, and *Hormodendrum* in summer. The study revealed a high incidence of positive skin test reactions, PTT and BDB-reactions, and the presence of atmospheric molds. An effective hypersensitization therapy using mixed mold extracts was found. Results indicate that

aerogenic molds are one of the causative factors of bronchial asthma among children.
APTIC-23213

EFFECTS OF COLD AIR AND CARBON DIOXIDE ON NASAL AIR FLOW RESISTANCE.
Ann. Otol. Rhinol. Laryngol., 78 (1):40-48, Feb. 1969. 7 refs.
Yasushi Takagi, Donald F. Proctor, Salah Salman, and Sandra Evering.
Identifiers: Adults, Nostrils, Breathing, Hyperventilation, Temperature, Carbon dioxide, Cooling.

Nasal resistance in resting respiration at ambient room temperature was compared with that at low temperature; the pressure-flow relationship in voluntary hyperventilation through the nose was analyzed in connection with that of carbon dioxide (7%) breathing through the nose. Nine apparently healthy volunteers, their ages ranging from 20 to 41, were subjected to a plexiglass mask attached to a pneumotachograph. The pressure-flow curves observed in room air breathing at rest formed approximate parabolas separately in inspiration and in expiration. Both linear and nonlinear components of the inspiratory resistance tended to be larger than those of expiration. A marked increase in nasal resistance was observed both in inspiration and expiration when cold air breathing was studied in six subjects. The increase appeared to be more prominent in the nonlinear component. Nasal resistance during carbon dioxide breathing was strikingly lower than that during the maximum voluntary ventilation through the nose in room air. Inspiratory resistance in the maximum voluntary ventilation was somewhat larger than the expiratory resistance. The variability in nasal resistance seems mainly to be related to the change in nasal mucosa. The amplitude of the pressure curves observed at the limit of tolerance of carbon dioxide breathing through the nose was evidently smaller than that of maximum voluntary ventilation through the nose. Therefore, mouth pressure may not be the only factor which influences the shift from nasal to mouth breathing.
APTIC-23228

HYPERPLASIA OF TYPE II PNEUMOCYTES IN THE LUNGS OF GUINEA PIGS EXPOSED TO 10 PPM OF NITROGEN DIOXIDE: AN ULTRASTRUCTURAL QUANTITATION.
Preprint, Southern California Univ., Los Angeles, Dept. of Pathology, 18p., 1970. 24 refs.
Ted G. H. Yuen, and Russell P. Sherwin.
Identifiers: "Type II pneumocytes," Guinea pigs, "Lungs," "Nitrogen dioxide (no2), Pathological techniques, Cells, Alveoli, Electron microscopy, Research methodologies, Statistical analyses.

The lungs of 20 guinea pigs, 12 of which were exposed to continuous 10 ppm nitrogen dioxide, were examined by electron microscopy and a quantitative study of alveolar wall cell populations carried out. Ratios of numbers of Type II Pneumocytes to total cells of the alveolar walls were determined by means of 304 electron micrographs of randomly selected fields at a uniformly low magnification of 1700X. A total of 9308 cells were counted in two independent studies. Highly significant statistical differences were found between ratios derived from control and exposed animal pairs sacrificed at intervals throughout a six-week study, indicating a strongly reactive hyperplasia of Type II Pneumocytes in response to a relatively low level of NO₂. From the cytologic examination, two outstanding alterations were found in the lungs of exposed animals: a more frequent occurrence of lamellar bodies with fine and closely packed lamellations and an increase in lipid bodies in Type II Pneumocytes and other cells. Of 676 Type II Pneumocytes found suitable for evaluation in the electron micrographs of exposed animal lungs, 66 contained a total of 170 lamellar bodies with the unusual lamellations. In the control group, only 17 lamellar bodies in 10 of 247 Type II Pneumocytes were found. The use of ultrastructural

quantitation to detect alterations in the cell populations of the alveolar wall and subcellular changes is encouraged by the findings. A potential application of importance is the evaluation of air pollutant effects at ambient levels, especially in respect to Type I Pneumocyte observations and quantitations. It is also anticipated that the methodology can play a valuable supporting role for large volume, light microscopy measurements of Type II Pneumocytes. (Author summary modified)
APTIC-23233

A PRELIMINARY SURVEY OF THE INDUSTRIAL HYGIENE PROBLEM IN THE UNITED STATES.
National Inst. of Health, Washington, D. C., Div. of Industrial Hygiene, Public Health Bull. 259, 132p., 1940. 159 refs.
J. J. Bloomfield, V. M. Trasko, R. R. Mayers, R. T. Page, and M. F. Peyton.
Identifiers: "Industrial hygiene," "Occupational health, Proposals, Federal governments, Medical personnel, Dusts, Fumes, Exhaust systems, Protective masks, Control methods, Safety equipment, Arsenic compounds, Metal compounds, Lead compounds, Silicon compounds, Silicates.

Industrial hygiene surveys made in the United States from 1936 through 1939 covered existing health services in industrial establishments, exposure to materials and conditions which might influence health, and an inventory of control measures in use. The present study is an analysis of such surveys conducted in 15 states and covering 16,802 plants employing 1487, 244 workers. With reference to safety provisions, it appears that only 25.6% of the workers have the services of a full-time safety director. Hospital facilities are available to only 15% of the workers and first-aid facilities to 51%. Full-time services of a physician are available to 15.5%, while full-time nursing services are provided for 33.3% of the employees. The analysis reveals that although accident records are kept on nearly all workers, sickness statistics are available for only 45.4% of all employees. The analysis of exposures to various materials and conditions of health significance shows that slightly more than 1,000,000 persons in this country are exposed to inhalation of silica dusts and 1,500,000 to silicate dusts. Of the various exposures to metal dusts and fumes, approximately 800,000 persons are handling lead and its compounds, 34,000 are exposed to arsenic and its compounds, and nearly 33,000 to mercury and its compounds. The highest exposure of all is in connection with the agents known to produce dermatitis. Examination of control methods for 1,503,204 exposures shows that 14.3% are provided with local exhaust ventilation, 3.2% with enclosed operations and 3.2% with respiratory protective devices. In the case of certain dusty trades, wet methods are employed in connection with 3.4% of the exposures. The development of industrial hygiene services, and their integration with state public health agencies, is recommended. (Author abstract modified)
APTIC-23234

THE PRESSURE SURROUNDING THE LUNGS.
Resp. Physiol. (Amsterdam), 5 (1):130-144, June 1964. 34 refs.
Donald F. Proctor, Paolo Caldiini, and Solbert Permut.
Identifiers: "Starling resistor," "Esophagus," "Pressure, Dogs, Diagnosis, Lungs.

A new method is employed (flow through a Starling resistor) for measuring pleural and esophageal pressure. In contrast to the esophageal balloon, this method is free from the problems associated with pressure to volume and shape distortion in the measuring device. It reflects the pressure existing over a very small area within the cavity, and can be readily moved back and forth within the cavity under study. Its efficacy is not impaired by extreme positional changes in the ex-

perimental subject, and it can be used to measure pressure within a cavity without the introduction of any air or liquid. Characteristics of the Starling resistor are cited, while studies of esophageal pressure were done with this technique in dogs anesthetized with sodium pentobarbital. In the horizontal supine position, the pressure is relatively constant from the diaphragm throughout the caudal portion of the thorax, becoming somewhat more negative in the cephalad portion, including some of the cervical esophagus. Pressure throughout the esophagus is somewhat more negative in the vertical head up position. There is a slight gradient of increasing negativity from the diaphragm to about two thirds of the distance to the top of the thorax, and there is a sharp increase of negativity in the upper third. In the vertical head down position, the pressure is somewhat more positive and varies less from top to bottom of the thorax than in the supine horizontal position. (Author conclusions modified)
APTIC-23273

PROPOSED INITIAL STUDIES OF THE RELATIONSHIP OF COMMUNITY AIR POLLUTION TO HEALTH.
Preprint, Dept. of Health, Education, and Welfare, Washington, D. C., Air Pollution Medical Program, 58p., Oct. 1955. 2 refs.
Thomas F. Mancuso, and J. Solon Mordell.
Identifiers: "Epidemiology," "Research programs, Socio-economic factors, Chronic, Laboratory animals, Humans, Morbidity, Mortality, Tissue cultures, Enzymes, Smoking, Synergism, Lung cancer, Carcinogens, Eye irritation, Health impairment, Asthma, Bronchitis, Donors, Urban areas, Bacteria, Fungi, Viruses, Pollens.

A number of proposed medical research studies involving the health effects of long-term exposure to low levels of atmospheric pollution are described. Morbidity and mortality in urban populations exposed to pollutants should be investigated in terms of geographical areas and socio-economic status. The possibility that people with specific diseases such as lung cancer, chronic bronchitis, asthma, or even problems due to smoking may be more susceptible to health impairment by pollutants should be investigated. A study of persons involved in the episode in Donora, Pa. might give some insight into long-term effects. Studies of biological changes as a result of exposure include tissue cultures, exposed laboratory animals, enzymes, and micro-organisms, specifically fungi, bacteria, virus, and pollens. Carcinogenic and synergistic studies are additionally required.
APTIC-23283

TOXICITY OF VAPORS IN THE PRESENCE OF AEROSOL CARRIERS (U).
Army Chemical Research and Development Labs., Edgewood Arsenal, Md., Toxicology Division, Subproj. 4-08-02-016-1, Rept. 2053, 65p., Nov. 1, 1955. 17 refs. CFSTI: PB 125596
V. Alexander Gordiyeff.
Identifiers: "Vapors," "Synergism," "Toxicity, "Aerosols, Acute, Hamsters, Mice, Rats, Mortality, Breathing, Health impairment, Adsorption, Hydrocyanic acid, Formaldehydes, Chlorinated hydrocarbons, Acetone, Organic sulfur compounds.

Results of toxicological experiments performed to test the hypothesis that vapor sorption on inert, airborne, carrier aerosols possibly increases the toxicity of a vapor are given. The experimental set-ups, involving exposure chambers of the semi-static and the dynamic type, are described. Mortality curves for rats, mice, and hamsters are compared for vapors of acetone, cyanohydrin, mustard gas, Sarin, phosgene, and formaldehyde in the absence and presence of various carriers. The mortality data do not show any significant differences which could be ascribed to the synergistic action of the carriers. This result confirms the predictions based on the studied mechanism of sorption of vapors by various airborne carriers. The

validity of these results is limited to acute inhalation toxicities of volatile substances sorbed on biologically inert aerosols. (Author abstract modified)
APTIC-23288

A SURVEY OF HUMAN BIOMETEOROLOGY.
TN-65, WMO-160.TP.78, 113p., 1964. 220 refs.
Personal Author Not Recorded.
Identifiers: *Bioclimatology, Planning and zoning, Animals, Humans, Treatment and aids, Digestive system, Nervous system, Adaptation, Health impairment, Europe, Automotive emissions, Oxidants, Particulates, Fuels, Incineration, Automobiles, Electricity (atmospheric), Meteorology, Winds, Humidity, Temperature (atmospheric), Carbon monoxide, Nitrogen oxides, Sulfur dioxide, Ozone, Solar radiation.

Human biometeorology studies the influences of the meteorological elements such as temperature, humidity, wind, radiation, and atmospheric electricity on man in health and in disease, his adaptability to changes in the environment, and the use of weather and change of climate in the treatment of human disease. Homeostatic mechanisms such as the nervous system and endocrine system are discussed in terms of adaptability. The influences of various meteorological parameters on human functions are studied. The influences of trace elements are considered. Sources and effects of various pollutants are listed, including fuel combustion, incineration, and automobiles, producing particulates, sulfur dioxide, carbon monoxide, nitrogen oxides, ozone and other oxidants. The effects of the influences of weather on diseases are tabulated. Drug effects, reaction speed, working efficiency, and accidents are all influenced by climate. The effects of town planning on the microclimatic environment of man are discussed. Farm animals and insects can be affected by climate, and in turn, they can affect man. The therapeutic utilization of climate is described. (Author summary modified)
APTIC-23293

ALVEOLAR PROTEIN ACCUMULATION: A SENSITIVE INDICATOR OF LOW-LEVEL OXIDANT TOXICITY.
Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, 19p., 1970. 10 refs.
Stephen Alpert, Barry B. Schwartz, Si Duk Lee, and Trent K. Lewis.
Identifiers: *Proteins, *Alveoli, *Toxicity, *Ozone, Rats, Oxidants.

Studies of the response of low doses of edemagenic gases have been hampered by the insensitivity and the nonquantitative nature of the major indicators of response. A new and more sensitive indicator, the recovery of I 131-albumin from the alveolar spaces six hours after its intravenous injection in rats was applied. Significantly increased albumin recovery was found for all concentrations of ozone at and above 0.5 ppm. No wet changes were noted below 2.5 ppm ozone, and there was no consistent histological finding except for slight sloughing of bronchial epithelium at 2.5 ppm. Application of these methods to studies of steroid effects revealed increased sensitivity to ozone following administration of methylprednisolone. In addition, animals treated with steroids and prior to exposure to 0.25 ppm ozone became tolerant to subsequent ozone challenge, while animals given pre-exposure but no steroids did not. (Author abstract modified)
APTIC-23298

POSTEXPOSURE RELATIONSHIP OF CARBON MONOXIDE IN BLOOD AND EXPIRED AIR.
Arch. Environ. Health, 21 (2):172-173, Aug. 1970. 6 refs.
Jack E. Peterson.
Identifiers: *Alveolar breath analysis, *Carboxyhemoglobin, *Carbon monoxide, Males, Breathing.

The postexposure relationship between venous blood carboxyhemoglobin saturation and the concentration of carbon monoxide in breath is described by a quadratic equation derived from data obtained from 25 experimental human exposures to CO. Venous blood samples for COHb and alveolar breath samples for CO were obtained during the absorption and the excretion phases of the exposures. During CO absorption, the concentration of CO in the alveolar breath was dependent upon both the exposure concentration and the amount of COHb in the blood. However, during the elimination phase when the ambient CO concentration was less than 1 ppm, the alveolar breath CO concentration appeared entirely dependent upon the COHb concentration. Alveolar breath analysis can be used to accurately estimate the percent COHb saturation in adult white males, provided the ambient CO concentration is near zero. (Author abstract modified)
APTIC-23318

INHALATION TOXICOLOGY AND LUNG EDEMA RECEPTOR SITES.

Am. Ind. Hyg. Assoc. J., 31 (4):454-459, July-Aug. 1970. 21 refs.
Arthur R. Gregory.
Identifiers: *Receptor sites, *Pulmonary edema, *Chlorinated hydrocarbons, *Nitrogen dioxide (no2), *Ozone, Genetics, Toxicity, Reaction mechanisms.

Existence of lung edema receptor sites for ozone, nitrogen dioxide, and phosgene is proposed as a more satisfactory lung edema formation mechanism than a simple overall 'burning' or tissue damage mechanism. The best indication that there is a physical/chemical action at a specific site is the fact that optical isomers of the same chemical structure have different activities. D-amphetamine is a psychic stimulant, while L-amphetamine is a peripheral vascular constrictant. Evidence for edemagenic receptor sites is presented. (1) There are wide phylogenetic variations in response to 'irritant' gases. Lizards can withstand 30 1/2 hours of ozone at 20 ppm. Different strains of the same species may have different median lethal concentrations for ozone. (2) There is ontogenetic variation in response to ozone and nitrogen dioxide. While neonates are resistant to the effects of NO₂, they are as equally as sensitive to HCN. Aromatic thiocarbamates administered parenterally cause lung edema in the adult rodent but not in the neonate. (3) Tolerance to ozone is induced by cervical cord section. (4) Brain injuries can produce lung edema in the presence of low left ventricular pressures. (5) Microspheres of starch injected into a small segment of one lung causes both lungs to become edematous. (Author abstract modified)
APTIC-23322

HYDROCARBONS AND ATMOSPHERIC POLLUTION.

For primary bibliographic entry see Field 03.
APTIC-23328

ULTRASTRUCTURAL STUDY OF RAT LUNGS UNDER CONDITIONS OF EXPERIMENTALLY INDUCED SILICOSIS; PART I.

(Studio ultrastrutturale sul polmone di ratti in condizioni di silicosi sperimentale). Text in Italian. Anat. Chir., 14 (1-2-3-4):201-213, 1969. 16 refs.
Wiktor Djaczenco, Arnaldo Cantani, Paolo Cimmino, and Enrico Garaci.
Identifiers: *Rats, *Silicosis, Autopsy, Lungs, Italy, Electron microscopy.

Artificial silicosis was induced in 20 white Wistar rats, and the results of autopsy, which included the use of an electron microscope, are interpreted, with special emphasis on the reaction of pneumocytes, which is especially prominent with type II, and the appearance of 'specific bodies' containing silicone.
APTIC-23345

PLASMA CELL ACCUMULATION IN RAT LUNGS UNDER CONDITIONS OF EXPERIMENTALLY INDUCED SILICOSIS; PART III.

(Accumulo di plasmacellule nel polmone di ratto in condizioni di silicosi sperimentale; Part III). Text in Italian. Anat. Chir., 14 (1-2-3-4):227-234, 1969. 12 refs.
Wiktor Djaczenco, Arnaldo Cantani, Paolo Cimmino, and Enrico Garaci.
Identifiers: *Rats, *Immunology, *Silicosis, Autopsy, Lungs, Italy, Electron microscopy.

Experimental silicosis was induced in 10 white Wistar rats by daily injection of one mg silicon powder for 30 consecutive days, after which the animals were killed. They were first anesthetized with ether, after which the thorax was rapidly opened and the fixing fluid was injected directly into the intact lungs. After the lung tissue had hardened, the lungs were removed from the bodies of the animals, and electron microscope slides were prepared from the lung tissues. The same type of autopsy was performed with 10 untreated rats, used as controls. The examination revealed an excess of granulocytes and 'brush cells' with respect to those that would be found in the lungs as a result of the normal blood content of these cells. It was found that the Golgi apparatus was either absent or imperfectly formed, and that the mitochondria were missing in the spaces between the tubules of the endoplasmic reticulum, and were piled up elsewhere in such a manner that they gave the impression of being composed of nuclear components. Closer examination indicated that this accumulation, which took place in the invaginations of the karyotheca, resulted from a close contact between the mitochondrion and the karyotheca. The number of tubules in the granular endoplasmic reticulum (GER) was high with respect to the control material, and the lumina of the tubules were inspissated at various places. All the lumina of these tubules were filled with a homogeneous material of medium optical density. Some cells contained a complex labyrinth formed by the tubules. The structure of the nuclei of the plasma cells did not differ morphologically from that found in the control animals, and the heterochromatin distribution was typical of plasma cells. The authors suggest the presence of an immunity factor in the development of silicosis as a pathological condition.
APTIC-23347

8. EFFECTS - PLANTS AND LIVESTOCK

SULFUR DIOXIDE GAS INJURY TO FRUIT TREES. I. COMPARISONS OF RESISTANCE OF FRUIT TREES AND EFFECTS ON LEAF FALL AND GROWTH OF CITRUS SPECIES.

(Kaju no arysungasu niyoru engai. Dai 1 po. Kaju no teikosei narabini kankitsurui no rakuyo oyobi seiku niyobosu eikyo nitsuite). Text in Japanese. Mie Daigaku hogakubu Gakujutsu Hokoku (Bull. of Faculty of Agriculture, Mie Univ.), 1964:11-32, Sept. 25. 26 refs.
Jiro Matsushima, and Manabu Harada.
Identifiers: *Citrus, *Plant growth, *Sulfur dioxide, Fruits, Plant damage, Japan, Exposure chambers.

Various annual plants and two- and three-year old fruit trees were treated continuously in exposure chambers to 1 and 5 ppm sulfur dioxide. A short-term experiment was conducted in summer at high chamber temperature and relative humidity; in long-term winter experiments, chamber temperature and humidity were only slightly higher than atmospheric. The summer experiment showed that grape and peach trees were most sensitive to SO₂, pear trees fairly sensitive, and citrus trees resistant with one exception. Tomato plants were very sensitive and rice plants moderately sensitive. Even with long-term fumigation extending over a three-week period, citrus species show no visible lesions, while most annual crops and weed plants were injured by 5 ppm within 1-7 days and some by 1 ppm within 10 to 13 days. Leaf fall of

citrus species was less in winter than in summer. However, the growth of the trees was reduced by long-term exposure, suggesting that invisible injury caused by SO₂ is not always negligible. (Author abstract modified)
APTIC-19094

DETERMINATION OF THE EFFECT OF SULFUR DIOXIDE ON PLANTS THROUGH LABORATORY EXPERIMENTS.
(Die Analyse von Schwefeldioxydwirkungen auf Pflanzen im Laboratoriumsversuch.) Text in German. Staub, (Duesseldorf), 21 (2):52-56, Feb. 1961. 8 refs.
Hans Van Haut.
Identifiers: *Necrosis, Plants (botany), Oats, Trees, Pinto beans, Germany, Nitrogen, Sulfur dioxide, Water.

Pot plants (radishes, rye, maple, oat, beans, pine) were exposed to various concentrations of sulfur dioxide for varying periods of time. Reactions of the plant during the various stages of development, as well as the influence of various environmental conditions, were observed in separate experiments with a constant SO₂/air mixture. The degree of injury was found to increase with the increase of the SO₂ concentration. For example, exposure to 3 mg SO₂/cu m air caused necrotic symptoms on only 2% of the leaf surface, while 12 mg SO₂ damaged 77% of the leaf surface. The functional dependence of damage or the effect of concentration and exposure time can be expressed by an exponential function. Short-term high concentrations are more damaging than long-term low concentrations. Most plants displayed greater resistance at night than during the day. The damaging effect of successive concentration peaks decreases with increasing length of pollutant-free intervals. While exposure to concentration peaks in intervals of 5 min damaged 50% of a leaf, exposure in intervals of two hours damaged only 5%. In many plants the lowest resistance to pollutants was observed shortly before blossoming. Plants well nourished with nitrogen were found to be more resistant. Faded leaves due to low moisture in the soil were injured less than well-watered plants.
APTIC-19338

INVESTIGATIONS PERTAINING TO THE INFLUENCE OF AIRBORNE DUST COMING FROM CEMENT FURNACES ON SOIL AND PLANTS.
(Untersuchungen über den Einfluss von Zementofen-Flugstaub auf Boden und Pflanze.) Staub (Duesseldorf), 21 (6):251-254, 1961. 8 refs.
Translated from German by Belov and Associates, Denver, Colo.
Fritz Scheffer, Eberhard Przemek, and Werner Wilms.
Identifiers: *Plants (botany), *Cements, *Dusts, Barley, Clover, Grasses, Plant growth, Germany, Soils, Furnaces, Simulation, Potassium compounds, Ph.

The effects of cement furnace dusts on plants and soil were investigated. Barley, German weidel grass, sugar beets, and Hungarian red clover were used in the experiments. No damage to the plants was observed over a two-year period. The soil pH increased, and during the second year, when the cement dust had a high potassium content, its lactate soluble K₂O content increased with increasing dust quantity. Barley showed a small decrease in yield with increasing dust. For the German weidel grass and Hungarian red clover, the increased alkalinity caused by the dusting process had a favorable effect on the mass yield. Sugar beets also showed an increased mass yield, and the plant contents remained unchanged. The possibility exists of an indirect influence on plant yield and the substances contained in the plants by the soil and by changes in the soil reaction and nutrient. Under certain circumstances this may lead to impairment of plant production. The dust sedimented in the vicinity of cement factories appears to have no im-

mediate danger for plants as long as its influence can be counteracted at the right time. The best counteraction can be achieved by the application of physiologically acid fertilization.
APTIC-19460

EFFICACY OF FUNGICIDES, HOT WATER AND GAMMA-IRRADIATION FOR CONTROL OF POSTHARVEST FRUIT ROTS OF PAPAYA.
For primary bibliographic entry see Field 02.
APTIC-19538

THE EFFECTS OF AIR POLLUTION ON PLANTS AND SOIL.
London, Agricultural Research Council, 1967. 53p. 198 refs.
C. C. Webster.
Identifiers: *Plants, *Soils, *Pollutants, Plants (botany), Plant damage, Plant indicators, Deposition, Great Britain, Farms, Engine exhausts, Dusts, Soot, Smog, Smokes, Fluorides, Lead compounds, Nitrogen oxides, Sulfur oxides, Sulfur dioxide, Photochemical reactions.

Recent trends in the emissions and concentrations of smoke, deposited matter, and sulfur dioxide in Britain and the effects of these pollutants on plants and soil are presented. Factors affecting the action of sulfur dioxide on plants are susceptibility of different species and varieties, stage of growth, time of day, environmental conditions, concentration of gas and time of exposure, intermittent exposure, and fluctuating concentration of gas. The effects on plants and soil of fluorides and photochemical or oxidant smog are considered. The contamination of plants near highways with lead from the exhaust fumes of motor vehicles is included. Plants as indicators of pollution are also discussed.
APTIC-19604

IMPLICATIONS OF AIR POLLUTION FOR PLANT LIFE.
Proc. Am. Phil. Soc., 114 (1):18-21, Feb. 1970. 17 refs. (Presented at the Symposium on Atmospheric Pollution: Its Long-Term Implications, April 25, 1969.)
Leonard H. Weinstein, and Delbert C. McCune.
Identifiers: *Plant damage, *Pollutants, Leaves, Banding, Chlorosis, Necrosis, Plant growth, Photosynthesis, Metabolism, Engine exhausts, Odors, Particulates, Coal, Furnaces, Chemical processing, Fertilizer manufacturing, Primary metallurgical processing, Fluorides, Peroxyacetyl nitrate, Sulfur dioxide, Ozone.

The effects of an air pollutant on a plant may vary with respect to their manifestation and the circumstances of their occurrence. The best known are the visible lesions that appear on the foliage taking the form of chlorotic or necrotic areas distributed on the leaf in patterns characteristic of the plant and the pollutant. In affected broad-leaved plants, fluoride symptoms appear as marginal areas of chlorosis or necrosis. Sulfur dioxide effects are irregular necrotic areas between the veins. The symptoms of ozone injury may be flecks or patches of dead tissue on the upper surface. Peroxyacetyl nitrate attacks the underside of the leaf, giving it a glazed appearance. In the narrow-leaved plants, the foliar symptoms of pollutant injury are banding of the tips of the leaves. There are other changes that are not immediately apparent in occurrence or significance, such as effects on growth, yield, crop quality, physiology, and metabolism. Two basic approaches may be taken for control of pollutants that damage plants. The access of the pollutant to the plant may be restricted, or the pollution source may be removed from the receptor. It is also suggested that plants be developed that will be more resistant, or that practices be developed that will modify the response of plants to air pollutants. A brief history of the damaging effects of pollution on plants is presented.
APTIC-19656

EFFECTS OF HYDROGEN FLUORIDE ON PRODUCTION AND FOOD RESERVE CONTENT OF BEAN SEED.
Preprint, Washington State Univ., Pullman, Air Pollution Research Section, 7p., 1969. 16 refs.
M. R. Pack.
Identifiers: *Plant damage, *Hydrofluoric acid, Leaves, Pinto beans, Plant growth, Metabolism.

Mature seeds of Tendergreen bean plants, grown under continuous exposure to hydrogen fluoride at 10.5 micrograms F/cu m, had a shriveled appearance and lower starch content than seeds of control plants. Two more experiments were conducted in which bean plants were exposed continuously to HF at 2.1 and 9.1 micrograms F/cu m. These seeds also matured more slowly in the HF treatment and tended to be shriveled and distorted. They had a faded blue-black color rather than the glossy black of the control plants. These differences were most pronounced in the higher HF treatment. The seed of the HF treated plants also had a lower starch content, suggesting that the fluoride interfered with starch synthesis. The HF treatments had no apparent effects on the reducing sugars, total sugars, water soluble polysaccharides, protein, or ether extract of the bean seed. Seedlings grown from the HF affected seed showed delayed emergence and less vigorous growth than control seedlings. The cordate primary leaves were abnormally small and distorted. (Author abstract modified)
APTIC-19657

CHANGES OF CONCENTRATION OF FREE AMINO ACIDS IN PLANTS UNDER THE INFLUENCE OF HYDROGEN FLUORIDE AND SULFUR DIOXIDE.
(Konzentrationsänderungen bei freien Aminosäuren in Pflanzen unter dem Einfluss von Fluorwasserstoff und Schwefeldioxid.) Text in German. Staub, Reinhaltung Luft, 30 (6):256-259, June 1970. 26 refs.
Uwe Arndt.
Identifiers: *Plants (botany), *Amino acids, *Fluorine, *Hydrogen, *Sulfur dioxide, Cells, Metabolism, Germany, Chromatography, Calibration methods.

After treating different types of plants for 14 days with air containing 6 micrograms of hydrogen fluoride/cu m or with air containing 0.7 mg of sulfur dioxide/cu m, their contents of free amino acids were determined by two-dimensional chromatography and were compared with those of the control plants. The individual amino acids were identified with the aid of calibration curves prepared using commercially available amino acids. Analyses of damaged plants showed, in general, increases of concentration of the individual acids. The same result was obtained after treating grass with HF in which no external symptoms of damage were evident. Plants treated with SO₂ and appearing undamaged, exhibited varying changes in concentrations of the individual amino acids, but there was also a trend towards higher total amino acid concentrations in this case. This suggests the possibility of utilizing the metabolic reactions investigated above as indicators of emission effects. To obtain a higher detection sensitivity of metabolic reactions, which are desirable as early indicators of emission effects, further studies are planned in which no extracts from the entire plant body but only those from certain cell complexes will be analyzed. This kind of sampling separates the various metabolic circuits from each other, which may react differently to the same emissions and, hence, lead one to expect more unequivocal results.
APTIC-19703

OBSERVATION OF COAL GAS DAMAGE TO FRUIT TREES.
(Beobachtung über Gasschaden an Obstbäumen.) Deut. Baumschule, vol. 3:10-12, 1951. Translated from the German. Belov and Associates, Denver, Colo.
H. Schmidt.

Identifiers: *Plant damage, *Chlorine, Alfalfa, Fruits, Trees, Vegetables, Germany, Coal.

The effects of chlorine gases, resulting from coal combustion, on vegetables and fruit trees are discussed. Damage to spinach, lettuce, endives, rhubarb, onions, peas, and cauliflower was observed in all cases. This damage resulted in a discoloration of the leaves until they were withered and brown. The vegetable plants recuperated according to the degree of damage especially when there was sufficient moisture. String beans, red beans, cabbage, and brussels sprouts were also heavily damaged during the fall of 1950. It was found that among the fruit trees the apple is the most sensitive. The leaves began to shrink, showed a dull pale green discoloration, and fell off within a short period of time. Depending on the degree of damage, loss of leaves was followed by a loss of young fruits. Well growing pear species were less damaged than the weaker growing species. Peaches and apricots lost their leaves during the spring after a pale green discoloration, and also lost some fruit. Among the berry-bearing fruits, gooseberries lost leaves and fruit, currants showed brown coloration of the leaves, and raspberries and blackberries suffered no damage. These observations indicate that considerable damage can be inflicted on cultured plants by industrial waste gases.

APTIC-19773

FIELD BIOLOGY AND CONTROL OF PHYTOPHTHORA PARASITICA ON PAPAYA (CARICA PAPAYA) IN HAWAII.
Ann. Appl. Biol. (London), vol. 63:53-60, 1969. 9 refs.

J. E. Hunter, and I. W. Buddenhagen.
Identifiers: *Fruits, *Plant damage, *Fungi, Trees, Spores, Pesticides.

Epidemic attacks of *Phytophthora parasitica*, the most serious fungal pathogen of papaya, developed during wet, windy weather, but declined rapidly when the weather became dry. During rain, abundant sporangia were liberated from the mycelial mats on infected fruits, but none was trapped in dry air. Collar rots and tree collapse caused by root rot occur irrespective of spray treatments and previous aerial infections on the same tree; they are no more prevalent in blocks with abundant aerial infections than in blocks with none. Basal rots occurred earlier and more frequently on plantings near abandoned diseased fields: they were scattered randomly and appeared before aerial infections. New outbreaks might be initiated from seeds of infected fruit, in which chlamydospores have been found, or from infected nursery seedlings. *Drosophila* spp. were occasional vectors of sporangia. Control of aerial infections was obtained with maneb, basic copper sulphate, captan or difolatan. Spraying only the upper half of the acropetally developing fruit cluster gave much better control than spraying only the lower fruits. (Author abstract modified)

APTIC-19872

EASTERN WHITE PINE, A TOOL TO DETECT AIR POLLUTION.

Southern Lumberman, 209 (2609):164,166, 1964.
Charles R. Berry.

Identifiers: *Plant indicators, Trees, Engine exhausts, Chlorine compounds, Sulfur dioxide, Ozone.

The use of Eastern white pine (*Pinus strobus* L.) as a sensitive air pollution indicator is described. There is a striking tree-to-tree variation among white pines in resistance or susceptibility to air pollution, implying that resistant seedlings might be raised in quantity and planted in polluted areas. It is also noted that different trees display a single gas in a given area, perhaps as a result of individual sensitivities of particular trees to a single gas in a mixed-pollutant atmosphere; such individual trees can be valuable in a pollutant analysis. It is known from experimental work that white

pine can be injured by fairly low concentrations of ozone and sulfur dioxide, and by chlorine; mortality from automobile exhaust has also been observed.

APTIC-20385

CHEMICAL REGULATION OF OZONE SUSCEPTIBILITY IN NICOTIANA TABACUM.

Can. J. Botany, vol. 44:487-496, 1966. 14 refs.

T. T. Lee.

Identifiers: *Tobacco, *Toxic tolerances, *Ozone, Leaves, Canada.

Detached leaves of *Nicotiana tabacum* (variety White Gold), treated with urea, potassium nitrate, kinetin, or p-hydroxybenzoic acid became more susceptible to ozone injury. The chemically induced susceptibility was reversed by a subsequent treatment with sucrose and, to a less extent, with 3,4-dihydroxybenzoic acid or L-cysteine, and the degree of reversibility was proportional to the duration and concentration of the respective treatment. Chemical modification of ozone susceptibility was effective on leaves at different stages of maturity. In the urea-treated leaves, the level of cytoplasmic non-protein nitrogen was positively correlated with the severity of ozone injury (correlation coefficient (r) equals 0.617). Positive correlations between leaf sensitivity and both total soluble nitrogen (r equals 0.718) and ammonia nitrogen (r equals 0.458) were also significant. A sucrose treatment after urea treatment effectively reduced the soluble-nitrogen fractions. (Author abstract modified)

APTIC-20387

EFFECT OF ELEMENTAL SULFUR DUST ON GROWTH OF CITRUS LEAVES, AND ITS RELATION TO THE BUFFER CAPACITY OF THE LEAF-TISSUE FLUID.

Am. J. Botany, vol. 38:560-566, July 1951. 33 refs.

F. M. Turrell, and F. M. Scott.

Identifiers: *Citrus, *Plant growth, *Sulfur compounds, Ph. Temperature.

Trees of Marsh grapefruit, Eureka lemon, Valencia and Washington Navel orange were exposed to 325-mesh dusting sulfur weekly throughout one growing season; abscission of grapefruit and lemon leaves was observed, as well as a reduction of their growth in length. The growth of Valencia and Washington Navel orange leaves increased. Reduced growth of sulfur-dusted leaves was correlated with small buffer capacities of the leaf-tissue fluids, and increased growth was correlated with large buffer capacities of these fluids. Although the volatility of elemental sulfur dust is low, volatility increases very rapidly with increase in temperature, and sulfur dusts or sprays may have little effect at moderate to low temperatures. (Author summary modified)

APTIC-20388

LOW-LEVEL TROPOSPHERIC OZONE.

Monthly Weather Rev., 94 (3):179-182, March 1966. 14 refs.

D. R. Davis, and C. E. Dean.

Identifiers: *Plant damage, *Lower atmosphere, *Ozone, Tobacco, Tomatoes, Non-urban areas, Air pollution episodes, Economic losses.

Non-industrially produced ozone is identified as the cause of damage to tobacco crops in the contiguous area of northern Florida and southern Georgia. The ozone is believed to be stratospheric in origin, having been transported to the lower troposphere by an extratropical storm. The damage was estimated at \$284,000, affecting 800 acres or one seventh of the area crop. Tobacco leaves are most susceptible to this type of damage at one stage of development. Late planting and difference in varieties grown were the primary reasons that the damage was not significant on the remainder of the acreage devoted to tobacco. The normal ozone concentration for the area is 0.4 parts per hundred million (pphm) by volume. The

concentration of 9 pphm was the first occurrence sufficiently high to damage the tobacco materially. Over the years, similar damage has been reported to tomatoes and other crops in the area.

APTIC-21446

SPORE MATURATION IN SOME SPECIES OF ERYSIPIHE.

Phytopathology, 59 (6):844-848, June 1969. 18 refs.

S. M. Pady, C. L. Kramer, and R. Clary.

Identifiers: *Fungi, *Spores, Diurnal, Plants (botany), Leaves.

Spore maturation and release in *Erysiphe polygoni*, *E. cichoracearum*, and *E. graminis* were studied in a growth chamber at 21°C, 90% relative humidity, and photoperiods of 8-12 hr. Kramer-Collins spore samplers were used to sample individual infected leaves continuously for 3-20 days. *E. polygoni*, a monoonidial type, produced one spore in 24 hr that was released 2-5 hr after the onset of the photoperiod, thus displaying periodicity in both maturation and release. *E. cichoracearum* matured spores continuously in chains through both the dark and light periods, but released them only in the light. This species has periodicity only in spore dispersal. *E. graminis* lacked diurnal periodicity in both spore maturation and release. Harvesting spores twice daily, and studies on spore development on individual conidophores, gave confirming data. Under controlled conditions, light appeared to be the main factor in spore maturation in *E. polygoni* and *E. cichoracearum*, but not in *E. graminis*. In darkness, *E. cichoracearum* had an apparent endogenous rhythm in spore release (Fig. 3), and it is probable that this is common among species with diurnal periodicity. (Author abstract modified)

APTIC-21911

PROTECTION OF PLANTS AGAINST AIRBORNE OXIDANTS: CUCUMBER SEEDLINGS AT EXTREME OZONE LEVELS.

Plant Physiol., vol. 37:261-266, 1962. 20 refs.

S. M. Segel.

Identifiers: *Plant damage, *Inhibition, *Ozone, Vegetables, Oxidation, Reduction.

A variety of oxidation-inhibiting or reducing substances (indole, IAA, tryptophane, mescaline, hydrazine, isonicotinic hydrazine, ascorbic acid, octadecene-1, and DPNH) protect cucumber seedlings against acute ozone exposures (2.5-5.8 mg/liter for 30 min); the observed protective activities include both increased survival of seedling populations and reduced inhibition of hypocotyl section elongation. Compounds with little or no antioxidant activity failed to protect against ozone damage; CoCl₂ intensified ozone damage, its other protective abilities notwithstanding. A comparison of root immersion, whole seedling immersion, and aerial application showed that protection of the aerial portion of the plant can be effected by compounds supplied entirely through the roots. (Author summary)

APTIC-21995

STUDIES ON THE INJURY OF RUSH PLANT BY SULFUR DIOXIDE GAS.

(Dai 1 poh Alyusan gas sesshokoo johken oyobi i goosa no seikoku jiki ni yotoku higai shohjoh no sai). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4 (1):131, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

S. Kamada, M. Yanai, and H. Yunomura.

Identifiers: *Sulfur dioxide, *Plant damage, Plant growth, Japan.

A study of the relationship between rush injury and sulfur dioxide was performed, since it is suspected that peculiar injury of rush at its latter growth period at Koorashiki area is related to sulfur dioxide, the main pollutant of nearby industrial area. Its injury starts at very low concentrations of sulfur dioxide when 0.06 to 1.0 ppm of sulfur dioxide

ide causes discolored dots which become similar to 'natural injury' after a couple of days. When contacting continuously with approximately 0.3 ppm sulfur dioxide, its injured portions become longer. Injury starts earlier and its damage is bigger at the latter part of the growth period (the latter part of May) than at the middle period (the middle and the latter part of April). The extent of injuries increases for the stalks offshoots earlier when they contact the gas at the same time and for the stalks offshoots at the same time, contacted with the gas at later part of the growth period. APTIC-22146

THE FLUORIDE PROBLEM.

For primary bibliographic entry see Field 01 APTIC-22547

TRACE-ELEMENT CONTAMINATION OF SOILS IN URBAN AREAS.

Trans. Int. Congr. Soil Sci., 9th, vol. 2:351-355, 1968, 14 refs.

D. Purves.

Identifiers: *Urban areas, *Soils, *Metal compounds, Europe, Non-urban areas, Boron compounds, Copper compounds, Lead compounds, Zinc compounds.

The spectrochemical analysis of top-soils from urban areas in Scotland indicates that in such soils, levels of copper, boron, lead, and zinc are substantially higher by comparison than are arable top-soils from rural areas. Urban garden soils, as a group, contain on the average about five times as much EDTA-extractable copper, twice as much water-extractable boron, four times as much acetic acid-extractable lead, and twenty times as much acetic acid-extractable zinc as rural, arable soils in South-East Scotland. These differences are so great that they must be due to contamination resulting from various kinds of human activity in urban areas. Sources of contamination and possible effects of the high levels on plants grown in urban areas are discussed. (Author abstract modified) APTIC-22926

AN EXPERIMENT IN CREATING PROTECTIVE PLANTINGS IN THE CITY OF KRASNOYARSK.

In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Effects and Symptoms of Air Pollutants on Vegetation: Resistance and Susceptibility of Different Plant Species in Various Habitats, in Relation to Plant Utilization for Shelter Belts and as Biological Indicators. M. Y. Nuttonson (ed.), vol. 2, Silver Spring, Md., American Institute of Crop Ecology, 1969, p. 79-84. (Also: Akad. Nauk SSSR Ural. Filial. Ural. Gos. Univ. Im. A. M. Gor'kogo. Okhrana prirody na Urals (Sverdlovsk), vol. 4:189-195, 1964.)

M. V. Bulgakov.

Identifiers: *Trees, *Adaptation, *Toxic tolerances, Leaves, Plant damage, Copper, Ussr, Industrial areas, Chemical processing, Primary metallurgical processing, Micrometeorology, Temperature (atmospheric), Fluorine, Sulfur dioxide.

Krasnoyarsk is a large center of copper smelting and chemical industry in the Central Urals. Large amounts of sulfur dioxide and fluorine, which are harmful to vegetation and man, are discharged to the atmosphere. The local natural forest was destroyed by SO₂, and as a result the city became unattractive and dusty. An arboreal nursery was established to aid in the selection of trees and shrubs adapted to local environmental conditions. An assortment of gas-resistant species for city plantings was developed, including poplar, birch, cedar, larch, maple, elm, Siberian pea shrub, elder, dogwood, sweetbrier, and others. Siberian pea shrubs from the local nursery and from another nursery were planted in a city park. The leaves on the plants from the local nursery

remained normal in appearance, while those from the other nursery were severely damaged by SO₂. This confirms the fact that the trees and shrubs for gas-polluted areas should be exclusively local, raised in the same noxious medium where they are to continue their growth. If frost-resistance is also desired, the plants should be raised under rigorous, spartan conditions. The establishment of parks and plazas, and the great number of trees and shrubs along the streets have made the air of the city cleaner and resulted in a milder microclimate. APTIC-22930

PLANT PHYSIOLOGY. ON THE DELETERIOUS ACTION THAT THE VAPOR EMANATING FROM MERCURY EXERCISES ON PLANTS.

(Sur l'action deleteree que la vapeur emanant du mercure exerce sur les plantes). Compt. Rend., vol. 64:924-929, 1867, 2 refs. Translated from French. Belov and Associates, Denver, Colo., 9p., March 12, 1970.

M. Bonasson.

Identifiers: *Mercury compounds, *Plant damage, *Petunias, Leaves, Inhibition, France, Sulfur compounds, Vapors.

The effects of mercury vapor on plants were investigated. When a mercury-filled capsule was placed on each side of a petunia stem, the leaves turned black, withered, and were hanging. Another petunia, enclosed under a dish-cover where there was no mercury, retained all its vigor. Experiments were also conducted on must plants. On the inner surface of one dish-cover sulfur was placed on the flower. In the other dish cover there was no sulfur. In less than 52 hours, the mint leaves in the dish containing only mercury had been completely destroyed. The leaves of the plant in the dish also containing sulfur were not affected. It was concluded that mercury vapor has a damaging effect on vegetation, and that the presence of sulfur counteracts the effect. APTIC-22952

THE INFLUENCE OF SULFUR DIOXIDE ON THE MINERAL COMPOSITION OF NEEDLES FROM SPRUCES.

(Einfluss des Schwefeldioxyds auf die mineralische Zusammensetzung der Fichtennadeln). Naturwissenschaften (Berlin), 48 (23):723-724, 1961, 3 refs. Translated from German. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 3p., Oct. 22, 1969.

Jan Msterna.

Identifiers: *Sulfur dioxide, *Trees, *Retention, *Mineral products, Plant damage, Czechoslovakia, Smokes, Calcium compounds, Magnesium compounds, Potassium compounds.

The question of whether mineral substances other than sulfur, silicic acid, and iron accumulate in the assimilating organs of smoke injured plants, particularly cations such as calcium, potassium, and magnesium is analyzed. Since analyses of injured needles alone cannot provide definite results, gassing tests with older spruces were performed. Two twigs were packed into polyethylene bags; one was gassed with air and sulfur dioxide, the other with pure air. Not only did the gassing increase the sulfur content, but also that of Ca and Mg; it caused a considerable increase of water soluble magnesium. A second gassing experiment was performed, which yielded no difference in the concentrations of Ca and Mg, but a markedly higher potassium content was found. APTIC-23041

INDUSTRIAL WASTES OF THE CITIES OF BAKU AND SUMGAIT AND THEIR EFFECT ON GREEN PLANTINGS.

In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Effects and Symptoms of Air Pollutants on Vegetation: Resistance and Susceptibility of Different Plant

Species in Various Habitats, in Relation to Plant Utilization for Shelter Belts and as Ecological Indicators. M. Y. Nuttonson (ed.), vol. 2, Silver Spring, Md., American Institute of Crop Ecology, 1969, p. 6-7. (Also: Akad. Nauk SSSR Ural. Filial. Komis. po Okhrane Prirody, Rasitel'nost' i promyshlennye zagryazneniya. Okhrana prirody na Urals. V (Sverdlovsk), 1966, p. 37-38.)

R. O. Amirov, and A. R. Ismaylov.

Identifiers: *Trees, *Plant damage, *Toxic tolerances, Leaves, Mottling, Flip burn, Plant growth, Ussr, Industrial areas, Fluorine compounds, Chlorine, Carbon monoxide, Sulfur dioxide, Hydrogen sulfide.

The industrial centers of the Apsheron Peninsula discharge a great amount of wastes, particularly carbon monoxide, sulfur dioxide, fluorine compounds, hydrocarbon vapors, chlorine, and hydrogen sulfide. In most cases, these compounds adversely affect green plants which function, at times, as protection against gas and smoke. When the air is polluted by irritant gases dark brown burns appear on the leaves. Partly withered and some yellowed leaves are also found. The toxic action of these pollutants also affects the root system. Trees which exhibit gas resistance include elm, maple, pistachio, oleaster, almond, honeysuckle, and others. The establishment and development of green trees are important as a means of combating air pollution and for the sanitary well-being of the industrial areas. Several recommendations for establishing green plantings in industrial areas are included. APTIC-23188

THE BREEDING OF SPRUCE AND PINE SPECIES WHICH ARE RELATIVELY RESISTANT AGAINST INDUSTRIAL WASTE GASES.

(Zuchtung von gegen Industrieabgase relativ resistenten Fichten- und Kiefernarten). Forstwiss. Zentr., vol. 81, 1962, 14 refs. Translated from German. Belov and Associates, Denver, Colo., 19p., July 7, 1970.

E. Rohmder, W. Merz, and A. V. Schoenborn.

Identifiers: *Trees, *Plant damage, *Stack gases, Plant growth, Germany, Hydrofluoric acid, Sulfur dioxide, Sulfur compounds.

Methods for determining the relative sensitivity of various types of coniferous trees to industrial waste gases are discussed, and attempts to breed more resistant strains of trees are described. Phenotypically resistant spruce trees are selected from damaged areas and used to supply grafts for testing purposes. The fact that the resistance is based on heredity is determined by exposing the grafts, along with pure sensitive samples, to varying concentrations of sulfur dioxide gas and hydrogen fluoride gas. No visible damage occurred on the grafts, while the others indicated symptoms. The chemical analysis of needles from resistant trees shows that they have lower sulfur values than more sensitive trees do. The resistant cuttings can be propagated and distributed in areas where more sensitive trees cannot survive. APTIC-23214

FACTORS IN THE FREQUENCY AND TYPES OF CANCER IN MAMMALS AND BIRDS AT THE PHILADELPHIA ZOO.

Ann. N. Y. Acad. Sci., vol. 108:793-804, Nov. 4, 1963, 17 refs.

R. L. Snyder, and H. L. Ratcliffe.

Identifiers: *Cancer, *Philadelphia, *Zoo, Animals, Age, Lung cancer, Carcinogens.

Records of cancer in the Philadelphia Zoo from 1901 through 1962 were reviewed and nine families of mammals and five families of birds were selected for statistical analysis. These are Cercopithecidae, Felidae, Canidae, Mustelidae, Procyonidae, Verrucidae, Ursidae, Bovidae, Cervidae, Anatidae, Phasianidae, Psittacidae, Fringillidae, and Ploceidae. During 1935 the traditional and often inadequate diets then in use in the Philadelphia Zoo for these and many types of other

animals were replaced by highly constant, high quality foods. One result of this change has been increased longevity, which has been accompanied by an increased frequency of cancer. Prior to 1935 only one lung cancer had been found in birds, which contrasts to 12 examples since that date. Ten of these 12 cancers have developed in Anatidae, and, whereas mean age at death for animals of all other groups has increased, the mean age at death for Anatidae has decreased since 1935. However, the Anatidae also produced six of the seven malignant hepatomas that developed in the birds of this series, and the frequency with which one or another site has been involved in one or more families may be interpreted as suggesting the action of specific factors. Among these are familial relationships, dietary deficiency of iodine and thyroid cancer, a high frequency of carcinomas of the nasal mucosa in one exhibition group, and the increase in lung cancers in ducks and geese. Although frequencies of malignant tumors were generally lowest during the first quarter of life and highest in the fourth quarter, in a majority of the families the frequency of cancer was higher in each corresponding quarter of life during the period from 1935 to 1962. It was concluded that the level of susceptibility or the dosage of carcinogens rather than the duration of exposure to carcinogens has been the major determining factor in increasing the frequency of cancer in these animals. (Author summary modified)

APTIC-23217

WHITE PINE EMERGENCE TIPBURN, A PHYSIOGENIC DISTURBANCE.

Southeastern Forest Experiment Station, Asheville, N. C., Div. of Forest Disease Research, Station Paper 130, 8p., Sept. 1961. 14 refs. Charles R. Berry. Identifiers: *Trees, *Tip burn, *Ozone.

Emergence tipburn, a needle blight of eastern white pine attacks young developing needles in early summer. Evidence indicating that the cause of emergence tipburn is atmospheric and environmental in nature is presented, and naturally-occurring ozone is suggested as a likely causal agent. Root mortality is greater on diseased than healthy trees, but this is regarded as a result of the loss of foliage. Many fungi were isolated from the roots, but none was associated consistently with the disease and none was a recognized root pathogen. Diseased trees transplanted to an area of less disease severity were thereafter affected less than checks left in the area where the trees were obtained. Diseased and healthy scions were grafted to diseased and healthy stocks. Ninety-one percent of the surviving scions persisted in their original condition regardless of the condition of the trees they were grafted to. Typical disease symptoms were produced on susceptible ramets by artificially ozonating the plants at 10 ppm for 2 hours. Ramets from a tree unaffected in the field were unaffected by the same treatment. Abnormally high incidence of emergence tipburn and tobacco weather fleck occurred in early summer in North Carolina in 1961, suggesting the two diseases are caused by the same or related factors. (Author summary modified)

APTIC-23219

SOME EFFECTS OF FLUORINE FUMES ON VEGETATION.

In: Air Pollution, U. S. Technical Conference on Air Pollution. Louis C. McCabe (ed.), New York, McGraw-Hill, 1952, Chapt. 10, p. 106-115. 1 ref. S. W. Griffin, and B. B. Bayles. Identifiers: *Plant damage, *Hydrofluoric acid, Diurnal, Corn, Leaves, Tomatoes, Plant indicators, Meteorology, Fluorine compounds.

Peach, apple, wild black cherry, Norway spruce, buckwheat, tomato, and corn plants were fumigated with relatively low and moderate concentrations of hydrofluoric acid gas in order to determine concentrations that might cause injury to

various species, the appearance and character of injury, and the absorption of fluorine by plants. A wide variety of soil, meteorologic, and plant variables are noted that must be considered in interpreting the data from these tests. The leaves of peach, wild black cherry, buckwheat, tomato, and corn are very susceptible to acute damage when exposed to small amounts of hydrofluoric acid in the air. Apple foliage was less susceptible. Acute leaf injury resulted from fumigation at night as well as in daylight, although the injury was less. Pin-point chocolate-colored lesions produced at the tip ends of peaches served as the entry point for fungi which caused rotting. Fluorine content of leaves was markedly increased, but even relatively heavy exposures caused little increase in the fluorine content of the fruit. Exposure of peach trees for a few hours to hydrofluoric acid gas concentrations as low as 0.05 to 0.1 ppm may cause acute damage to a small percent of the leaves, but that higher concentrations or longer exposures are required to cause twig or shoot damage. The usefulness of buckwheat and various coniferous species as indicators of fluorine and other toxic gas pollution is discussed, as well as the fluorine content of soils. Lime applied to soils to which fluorine had been added greatly reduced the uptake of fluorine from the soil and prevented plant injury. (Author summary modified)

APTIC-23222

CHANGES IN THE LICHEN FLORA FOLLOWING AIR POLLUTION.

Oikos, 20 (2):547-552, 1969. 8 refs. Erik Skye, and Ingemar Hallberg. Identifiers: *Lichen, *Petroleum refining, *Plant damage, Plants (botany), Trees, Plant growth, Sweden, Fungi, Distillate oils, Sulfur dioxide, Ph.

Lichen flora on tree trunks around a shale oil works were analyzed with regard to composition and distribution in 1951/1953 and in 1967/1969. Changes in lichen distribution were observed and attributed to increased levels of atmospheric sulfur dioxide that persisted until production at the shale oil works was terminated in 1966. Between 1953 and 1967, lichen species normally connected with acid barks increased markedly. Their appearance on trees that normally have only moderately acid bark indicates that the substrate is obviously being acidified within the investigation area. Bark originally of relatively high pH needs a longer time or more intensive exposure to acid chemicals to reach a pH level within the tolerance of lichens normally found on acid bark. Probably direct poisoning of the lichens also plays a part in these changes. By the summer of 1967, some signs of recovery were observed in certain lichen species, in particular strong lobe growth in lichen thallus.

APTIC-23257

EFFECTS OF ACIDITY ON THE FISH FAUNA OF TWO SMALL LAKES IN BOHUSLÄN, SOUTHWESTERN SWEDEN.

(Forsurningens effekter på fiskfaunan i två bohuslänks småsjöar). Text in Swedish. Fauna Flora, no. 1:11-20, 1970. 10 refs. Hans Hultberg, and Jan Stenson. Identifiers: *Fish, *Lakes, *Ph. Animals, Sweden, Rain, Copper compounds, Lead compounds, Zinc compounds, Sulfates, Ions, Ph.

Between 1962 and 1969, the pH of surface water in two oligotrophic lakes decreased from about 5.8 to 4.6-4.8 due to the presence of sulfate ions in rainwater. A very high incidence of sulfate ions was observed in the lake water. When fish were collected for analysis by treating the lakes with rotenone, the pH values were lethal to eggs and fry, but not to fish in advanced stages of development. Adult pike appeared to be more resistant to low pH than adult perch. The effect of pH on eels is not clear; all collected eels were in good condition. The industrial dust that partly covered the lakes contained toxic lead, copper, and zinc.

APTIC-23258

OBSERVATIONS ON THE SULPHUR CONTENT OF PINE NEEDLES FROM THE ENVIRONMENT OF POINT AND AREA SOURCES.

Work-Environ.-Health, 6 (1):41-43, 1969. 6 refs. Arvo Laamanen, and Risto Lahdes. Identifiers: *Mapping, *Point sources, *Sulfates, *Plant indicators, Trees, Europe, Fuel oils, Electric power production, Paper manufacturing.

Sulfate analyses were carried out on needles of pine trees in the environment of a sulfate cellulose factory and a district heating installation using heavy fuel oil. Equiconcentration isopleths of SO₄ with a valence of minus two were drawn on a map of the region. A negative correlation between the distance from the source and the sulfate concentration in the samples was noted. (Author summary modified)

APTIC-23261

INJURY TO VEGETATION AND ANIMAL LIFE BY SMELTER WASTES.

Dept. of Agriculture, Washington, D. C., Bureau of Chemistry, Bull. 113 (Rev.), 63p., July 7, 1910. 22 refs.

J. K. Haywood.

Identifiers: *Cattle, *Plant damage, *Copper, *Primary metallurgical processing, Corn, Wheat, Trees, Mortality, Thresholds, Metal poisoning, Soils, Stack gases, Settling particles, Fumes, Analytical methods, Arsenic compounds, Copper compounds, Sulfur dioxide, Sulfur trioxide.

The injurious effects which wastes from sulfur-bearing copper ore smelting operations have on animal and plant life are considered. Sulfur contained in the ore is given off as sulfur dioxide and sulfur trioxide. Arsenic, which is often present in the ore, is given off in fumes which settle out and deposit on the crops surrounding the smelter. Waste water containing copper can percolate through the ground and reach streams. Particulates discharged through the stack settle out, causing injury to plant life. Mechanisms of damage to plants are discussed, and thresholds for SO₂ are given. Results of field investigations to determine the extent of damage to plants are reported. Trees, corn, wheat, and other plants are injured to varying degrees. Studies of the arsenic content of crops and soils prove that cattle deaths are attributable to arsenic poisoning. Methods of analysis used on plants, soils, water, and ores are described.

APTIC-23267

THE EFFECT OF INDUSTRIAL SMOKES AND GASES UPON CONIFEROUS FORESTS GROWING UNDER CONDITIONS OF INCREASED HUMIDITY IN THE MOSCOW REGION ('PODOMOSKOV'E').

In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Vol. III. The Susceptibility or Resistance to Gas and Smoke of Various Arboreal Species Grown Under Diverse Environmental Conditions in a Number of Industrial Regions of the Soviet Union. M. Y. Nuttonson (ed.), Silver Spring, Md., American Institute of Crop Ecology, 1970, p. 39-44. 12 refs. Translated from Russian. (Also: Byull. Gl. Bot. Sada, no. 46:41-46, 1962.)

V. G. Antipov.

Identifiers: *Humidity, *Trees, *Plant damage, *Industrial areas, USSR, Stack gases, Smokes, Absorption, Fog, Hydrofluoric acid, Aldehydes, Ammonia, Carbon monoxide, Nitrogen oxides, Sulfur dioxide, Ozone, Sulfates, Hydrogen sulfide.

An investigation of the relationship between industrial pollution and damage to coniferous trees is presented. A definite correlation between the destruction of pines and their distance from industrial enterprises is noted. The accumulation of sulfates, by the assimilating mechanism, is one of the verified symptoms of damage to plants from sulfur dioxide. The effect of humidity upon the concentration of atmospheric pollutants is discussed. The presence of fog increases the concentration of pollutants. Increased humidity is not only conducive to acidic fogs, but also prevents

the closing of the stomata, a condition which allows easier penetration of pollutants. The toxicity of sulfur gases is increased if carbon monoxide, nitric oxides, aldehydes, and ozonides are present. Ammonia, hydrogen sulfide, and hydrogen fluoride are other serious contaminants.

APTIC-23295

9. EFFECTS - MATERIALS

DEVELOPMENT OF SULFATE POCKETS IN RUST IN THE ATMOSPHERIC CORROSION OF STEEL. I.

(Entstehung von Sulfatnestern im Rost bei der atmosphärischen Korrosion von Stahl I). Text in German. *Werkstoffe Korrosion*, 21 (5):342-346, May 1970. 9 refs.

J. Honzak, and D. Kuchynka.

Identifiers: *Corrosion, *Steel, *Sulfates, Czechoslovakia, Operating variables.

The development of sulfate pockets was studied with the aid of radiochemical methods. Pulverized carbonyl iron was slowly introduced into diluted sulfuric acid labeled with S (35). The solution was moderately heated and nitrogen was passed through it. Upon reaching a pH of 6.2, the reaction was considered terminated. Steel samples with a width of 30 mm and a thickness of 3 mm were wetted with 0.05 ml iron sulfate solution. By drying in a flow of warm air, a uniform layer of iron sulfate was produced. The steel samples, thus prepared, were placed into containers with varying degrees of relative humidity. The uniform iron sulfate layer dissociated rapidly into clearly outlined pockets. The points of accumulation of sulfate ions were considered corrosion anodes to which sulfate ions are transported under the influence of an electric field. The number of sulfate pockets decreased as the corrosion took its course. The number of sulfate pockets was a function of the iron sulfate concentration applied to the steel surface. With increasing relative humidity, the final number of sulfate pockets decreased. The iron sulfate layer no longer formed pockets between 68 and 85%.

APTIC-19226

PROCESS OF FORMING STABILIZED LAYER OF RUST (STUDY ON THE RUST ON THE STEEL EXPOSED TO ATMOSPHERE-V).

(Sabito no anteika nitaru keika (Tekko no taiki bakuro sabi nikansuru kenkyu-V)). Text in Japanese. *Tetsu To Hagane*, 56 (4):243, March 10, 1970. (Presented at the Iron and Steel Inst. of Japan Annual Meeting, 79th, Tokyo, Japan, April 8-10, 1970.)

Iwao Matsushima, and Tadayuki Ueno.

Identifiers: *Corrosion, *Steel, Seasonal, Japan, Dusts, Rain, Oxidation.

A steel designed to protect itself by the formation of a non-erosive stable coating of iron oxide was exposed to the atmosphere at different periods of the year and at various geometries to test for the stabilization of the rust layer. In an industrial area, the exposed steel was covered with a thin layer of yellow or orange rust after the first rainfall. The color changed from red to brown and, finally, to dark brown. The gradual change in appearance was dependent on several factors, including location, month of year, and geometry of exposure. The weathering steel and S341 steel were mounted on a standard exposure frame in various months of the year. After specified periods, the appearance, weight decrease by corrosion, and the amount of rust were monitored. The corrosivity of the atmosphere was at a maximum from June through August, gradually decreasing to a minimum in February through April. The weathering steel mounted in August formed a thick layer of rust after the first two months, then became stabilized. Those mounted in winter, on the other hand, showed little rust at the beginning, but had a worse appearance after a rainy season in June. The result of the geometry test showed that of the steels exposed to rain, those protected by good drainage of

rusty water and also against dust accumulation presented the best appearance.

APTIC-22161

EFFECT OF HYDRODESULFURIZING PROCESS VARIABLES ON CORROSION RATES.

For primary bibliographic entry see Field 02.

APTIC-22355

THE CORROSION OR DETERIORATION OF CONCRETE.

Australasian Corrosion Eng., 14 (5):5-15, May 1970. 9 refs. (Presented to the Australasian Corrosion Association, 10th Annual Conference, Perth, Nov. 10-14th, 1969.)

D. R. Buchanan.

Identifiers: *Concrete, *Corrosion, Australia, Sea salts, Sulfuric acid, Sulfates, Temperature.

Concrete consists of two materials, aggregate, and sands and pastes (water and cement). Concrete deterioration is a result of either internal agents (incorrect mixing or material selection) or external agents or environments which affect the durability of the cement paste. Internal agents which affect aggregates include organic impurities, sulfide ores, sulfate minerals, and alkali reactive materials. Water can be contaminated by suspended matter, or by various salts and other chemical compounds. Chemical attack of concrete is carried out by sulfates, sea water, acids, and frost. Impermeability of concrete will protect it from many chemical attacks. Fire or other severe temperature exposure can crack concrete due to differences in thermal expansion. Various types of cement are tabulated, as well as the effects on concrete of many chemical compounds.

APTIC-22410

EFFECTS AND COUNTERMEASURES OF AIR POLLUTION INDUSTRIAL PRODUCTS AND MEDICINE.

For primary bibliographic entry see Field 02.

APTIC-22530

REACTION OF CELLULOSIC FABRICS TO AIR CONTAMINATED WITH SULFUR DIOXIDE.

Textile Res. J., 40 (8):693-699, Aug. 1970. 10 refs.

S. H. Zeronian.

Identifiers: *Cottons, *Synthetic fibers, *Sulfur dioxide, Sulfuric acid, Hydrolysis, Visible radiation.

Fabrics made from cotton, viscose rayon, or high-wet-modulus rayon were exposed to air or to air containing 0.1 ppm sulfur dioxide and simultaneously to light from a xenon arc lamp. The presence of sulfur dioxide caused an additional loss in the breaking strength of yarn taken from the cotton and regenerated cellulose fabrics, compared to the loss in light and air alone. The chemical modifications that occurred in the fabrics were followed by measuring copper numbers, carboxyl contents, and free radicals. The changes that were observed were compared to similar samples degraded by hydrolysis in dilute sulfuric acid. In a set of preliminary experiments, fabric made from cotton containing a durable-press finish was also exposed to the same conditions as the cotton and regenerated cellulose materials. There was no loss in strength of yarn from the resin-treated fabric, when exposed to light plus air or to light plus air containing sulfur dioxide. In fact, exposure to light and air caused a significant increase in breaking load. (Author abstract)

APTIC-22832

EFFECTS ON ATMOSPHERIC CONTAMINATION ON THE PERFORMANCE OF CARBON BRUSHES ON COPPER SLIP RINGS.

Naval Postgraduate School, Monterey, Calif., Dept. of Electrical Engineering, Thesis (MS), Oct. 1969, 67p. 48 refs. CFSTI, DDC: AD 706025

Philip Farr Grasser.

Identifiers: *Brushes, Carbon black, Power sources, Ships, Chromatography, Hydrochloric acid, Ammonia, Fluorinated hydrocarbons, Methanes, Acetylenes, Acetone, Sulfur dioxide.

An annoying maintenance problem associated with nuclear submarines is rapid deterioration of collector and commutator brushes on motor generators. Overbrushing has been suggested as a possible cause of these difficulties. To determine whether the atmosphere aboard nuclear submarines is contributing to collector problems, 24-hr brushing tests were conducted in stainless steel chambers contaminated by acetone, acetylene, ammonia, Freon-12, Freon-114, hydrogen chloride, methane, and sulfur dioxide. National Carbon grade 258 electrographite brushes were used in all tests. At the end of each test, the amount of contaminant remaining in the system was determined by gas chromatographic analysis. The chromatographic test results were not particularly satisfying. The input volumes of the more volatile contaminants were badly depleted by the end of the 24-hr tests. Since brush dust has the absorbent characteristics of activated charcoal, it is possible that the gases were removed by the dust. However, the possibility of leakage cannot be ignored. The low wear rate, 2.0 mils/24 hr (4.1 times 10 to the minus seventh power), for a brush in an uncontaminated chamber compares well with data showing that the best power brushes wear at about 6.0 times 10 the seventh power cm/km. Even the worst case, the wear rate of hydrogen chloride, was only about 6.0 mils/24 hr (1.05 times 10 to the minus sixth power) cm/km. This rate is less than that of aircraft brushes at sea level.

APTIC-22894

TESTING THE CORROSION RESISTANCE OF PROTECTIVE COATINGS IN THE TROPICS.

(Tropenprüfung von Korrosionsschutzüberzügen und -schichten). Text in German. *Plaste Kautschuk*, 13 (6):367-369, 1966.

Margot Rachaer, and Ruth Hoermann.

Identifiers: *Tropics, *Corrosion, *Surface coatings, Aluminum, Cadmium, Steel, Zinc, Germany, Urban areas, Micrometeorology.

Electrolytically applied zinc and cadmium coatings and chemical coatings based on linseed oil, phthalates, nitrocellulose, alkyl resin, polyvinylchloride, and silicone applied to steel, steel alloys, and plywood of Finnish birch were exposed to the hot and humid atmosphere of Hanoi, to the dry heat of Damascus, and to the atmosphere of Berlin in a comparative corrosion resistance study. After a 40-month-long exposure in Hanoi, both the Zn- and Cd-coated test pieces were intact while identical test pieces after a 45-month-long exposure to the atmosphere of Berlin were covered with rust by 80%. Unprotected aluminum samples corroded faster in Berlin than in Hanoi. Alkyl resin and nitrocellulose varnishes afforded good protection against corrosion in the tropics if heavily applied. Data about the degree of corrosion resistance of the other materials tested are furnished. The tests indicate that meteorological conditions by themselves do not determine the degree of corrosion of protective coatings but that pollutants like sulfur dioxide, carbon dioxide, chlorine, industrial dust, and soot exert a greater influence. The atmosphere of Berlin with its considerably milder climate had a much more corrosive effect on the sample coatings tested than the tropical climate of Hanoi.

APTIC-22901

MECHANISMS OF METAL REMOVAL BY IMPACTING DUST PARTICLES.

J. Basic Eng., 92 (3):639-654, Sept. 1970. 11 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, Los Angeles, Nov. 16-20, 1969, Paper 69-WA/Met-8.)

C. E. Smeltzer, M. E. Gulden, and W. A. Compton.

Identifiers: *Materials deterioration, *Metals, *Dusts, Aircraft, Gas turbines, Particle size, Elec-

iron microscopy, Mathematical analyses, Flow rates, Reaction mechanisms, Surface properties.

Effects upon solid-particle erosion were studied of such material and environmental variables as target alloy composition and heat-treat condition; dust particle velocity, size, concentration, velocity, and kinetic energy; carrier-gas true temperature and impingement angle. Small gas turbines powering helicopters and hovercraft over dusty, unimproved land areas routinely ingest 3-25 lb of sand and dust into each compressor every hour of low altitude operation. In an attempt to gain further insight into the actual mechanism of erosion, the target surfaces were examined at high magnification using metallographic techniques and electron microscopy. The actual metal removal process (erosion) is a minor by-product of the principal energy absorbing surface reaction (i.e., deformation). Furthermore, the amount of surface deformation appears to be most strongly dependent on the characteristics of the individual impacting particle (i.e., orientation, shape, and mass) rather than on the target material and environmental variables. There was more variation in surface damage within each target than there was among them. A new approach to the analysis of erosion loss data is suggested, using the average erosion loss per single particle impact instead of the standard erosion factor, when comparing data from different dust environments. Erosion loss per particle varies linearly with particle volume and mass, at constant velocity, through the particle size range of 20-175 micron.

APTIC-22968

STRUCTURE OF RUST LAYER FORMED ON ATMOSPHERIC CORROSION RESISTANT STEELS.

(Taikoseiko ni shojita seiso no kozo). Text in Japanese. Tetsu to Hagane, 56 (10):1342-1351, Sept. 1, 1970. 6 refs.
Masamichi Kowaka, Jiro Satake, Taishi Moroiishi, and Nobukatsu Fujino.
Identifiers: *Corrosion, *Steel, Japan, Non-urban areas, Industrial areas, Electron microscopy, Exposure methods, Chromium compounds, Copper compounds, Phosphorus compounds.

The distribution of elements in the rust layer formed on low alloy steels after various periods of exposure in industrial and rural atmospheres was investigated by means of a microscope examination and an electron probe microanalysis. The rust layer in large pits contains copper, phosphorus and chromium in a localized state. Cr and P concentrate around such defects in the rust as voids and cracks. The local concentration of Cu seems to diminish as the exposure period becomes longer. The rust layer on the flat surface surrounding large pits and also the surface layer above the large pits have shown no evidence of localized concentration of Cu and P and little Cr content. Si, the main constituent of dusts, has been found in these parts of the rust, but none in the pits. It is supposed that Cr, P and Cu produced by corrosion reaction presumably form far less soluble compounds than ferrous ion and are likely to precipitate in the pits while ferrous ion diffuses out from the pits and precipitates on the outer surface.

APTIC-22969

METHODS OF EVALUATING THE PROTECTIVE PROPERTIES OF PLASTIC FILMS.

(Metody otsenki zashchitnykh svoystv plastmassovykh plenok). Text in Russian. Plast. Massy, no. 7:66-69, 1968. 9 refs.
Ye. I. Sergeyeva, Yu. N. Mikhaylovskiy, and G. K. Berukshits.
Identifiers: *Corrosion, *Plastics, *Surface coatings, Iron, Nickel, USSR, Measurement methods, Humidity, Sulfur dioxide, Electrical resistance, Temperature.

Two methods for evaluating plastic protective films are discussed. The first involves use of an electric microcorrosion simulating device which is

used to test protected surfaces as they are subjected to established temperature regimes (20-80 C over 1.5 hrs, 80-140 C over 3 hrs). The second method measures the increase in electrical resistance of a small specimen whose thickness decreases as the result of induced corrosion. These methods were used to determine the effectiveness of polymeric protective films on iron and nickel in atmospheres of varying humidity and sulfur dioxide content. Data presented show that in the presence of high SO₂ content, corrosion is greater under polyvinyl chloride film than under polyethylene. When SO₂ concentration was increased from 10 to 20 mm Hg, corrosion of iron under a polyvinyl chloride film (230 mu thick) increased 4-fold while the increase for a polyethylene film was only 3-fold.

APTIC-23014

DIFFUSION OF ATMOSPHERIC GASES INTO SOLID METALS DURING SPONTANEOUS SURFACE CLEANING.

(O rastvorenii gazov vozdukh v tverdom metalle v protsesse samopochistiv'noy ochistki ego poverkhnosti). Text in Russian. Doklady Akad. Nauk SSSR, 181 (1):79, 1968. 1 ref.
B. Ye. Paton, B. I. Medovar, G. A. Boyko, L. G. Puzrin, and G. M. Grigorenko.
Identifiers: *Steel, *Absorption, *Nitrogen, *Oxygen, Chromium, USSR, Diffusion, Oxidation, Surface properties, Temperature.

Hollow steel specimens fabricated from a combination of carbon steel and austenitic steel, each with a different chromium content, were heated to 1200 C to establish nitrogen and oxygen absorption from the atmospheric air retained in the sealed cavity. All combinations tested showed a loss of both oxygen and nitrogen from the carbon steel and a gain by the austenitic steel, regardless of whether the surface of the latter was oxidized at the outset. This transfer is thought to result from the high-chromium steel acting as a receiver. No numerical data are given.

APTIC-23019

EFFECT OF SULFUR DIOXIDE ON IRON AND STEEL.

(Ueber den Einfluss von Schwefeldioxyd auf Eisen und Stahl). Text in German. Korrosion Metallisch, 15 (9):295-298, 1939. 9 refs.
W. Baukloh, and I. Valca.
Identifiers: *Sulfur dioxide, *Corrosion, *Iron, Carbon black, Steel, Iron compounds, Iron oxides, Sulfides, Temperature.

Observations were made of scaling in Krupp soft iron and two carbon steels, from 200 to 1000 deg. It was found, from a study of the physical properties of the scaling layers, that these were made up essentially of iron sulfide or ferroferric oxide and iron oxide. Carbon has a tendency to reduce scaling. Studies were also made with moist sulfur dioxide at room temperature, revealing that the amount of corrosion varied as a linear function of time.

APTIC-23065

WATER POLLUTION DUE TO AIR POLLUTION.

(Taiki osen ni yoru suishitsuosen). Text in Japanese. Kukichowa to Reito (Air Conditioning Refrig.), 10 (2):41-51, Jan. 13, 1970.
Masumi Mizutani.
Identifiers: *Automotive emissions, *Combustion gases, *Water pollution, *Air conditioning equipment, Corrosion, Metals, Aluminum, Copper, Iron, Zinc, Japan, Engine exhausts, Chemical processing, Metal fabricating and finishing, Rubber manufacturing, Automobiles, Buses, Trucks, Hydrochloric acid, Hydrofluoric acid, Sulfuric acid, Hydrocyanic acid, Ammonia, Bromine compounds, Chlorides, Cyanides, Fluorides, Chlorine, Nitrogen oxides, Nitrogen dioxide (no2), Sulfur dioxide, Carbon disulfide, Hydrogen sulfide.

Bursting of copper condenser pipes of air conditioners and refrigerators rapidly increased since 1966. Five hundred incidents were recorded in the summer of 1969 in the Osaka area. The primary cause of the incidents was found to be the air pollution from flue gas from factories and automobile exhausts. Construction materials of the cooling system for cooling towers, for example, iron, copper, zinc, aluminum, and their alloys, can be corroded or pitted by the following pollutants: NH₃, SO₂, H₂SO₄, HF, HCN, HCHO, H₂S, HCl, NO₂, CH₂ equals CHCHO, C₂, CS₂, HSO₃Cl, and Br₂. The water for the condenser is polluted by sulfur dioxide in the atmosphere and by the other pollutants from metal plating, acid rinsing, rubber, and other chemical processes. Ammonia in the exhaust from lavatories or sewage processing plants also becomes the source of corrosion. The cooling water pollution was also found in the vicinity of heavy traffic intersections, polluted rivers, and at the seaside. A cooling tower installed near an ammonia refrigerator had a trouble of this kind. Even in the countryside, insects sucked into a cooling tower caused water pollution. Countermeasures, such as checking the cooling tower, the use of lower water corrosion tester and anti-corrosion agents are described. A sample of Water Quality Check List Card is presented. The paper concludes with a gloomy view of more air pollution and corrosion troubles in the future.

APTIC-23108

SORPTION OF SULPHUR DIOXIDE BY INDOOR SURFACES. II. WOOD.

J. Appl. Chem. (London), 20 (7):226-228, July 1970. 8 refs. Part I. Ibid., vol. 20:143, 1970.
D. J. Spedding.
Identifiers: *Wood, *Absorption, *Sulfur dioxide, Great Britain.

The sorption of sulfur dioxide by untreated wood was investigated at SO₂ concentrations similar to those found inside houses in industrial districts. In the experiments, wood samples were placed in a sealed polyvinyl chloride room and exposed to SO₂ (35) obtained from sealed glass ampoules, the breaking of which produced an initial SO₂ concentration of 94 micrograms/cu m. Within two hours, the concentration fell to less than 10 micrograms/cu m and after 30 hr to 0.03 microgram/cu m. Softwoods sorbed less SO₂ than hardwoods. They also sorbed SO₂ predominantly in the spring-wood zone, while hardwoods showed the highest sorption in the summerwood zone. The average SO₂ uptake of the woods was 50 micrograms/cu m, similar to that of conventional wallpapers. With all the samples tested, most of the SO₂ was bound to the outermost 0.05 mm of the timber; no SO₂ was detected deeper than 0.3 mm below the surface. The sorbed SO₂ is undoubtedly converted to a large extent to sulfite and then oxidized to sulfate. These reactions may be contributory factors in the weathering of unprotected wood surfaces.

APTIC-23340

10. ECONOMIC ASPECTS

WHAT DOES IT COST TO DESULFURIZE FUEL OIL.

For primary bibliographic entry see Field 02.
APTIC-18191

THE COST OF AIR POLLUTION DAMAGES: A STATUS REPORT.

Public Health Service, Raleigh, N. C., National Air Pollution Control Administration, 94p., July 1970. 70 refs.
Larry B. Barrett, and Thomas E. Waddell.
Identifiers: *Costs, *Economic losses, Litigation, Plants (botany), Plant damage, Health impairment, Materials, Soiling, Residential areas, Particulates, Hydrocarbons, Carbon monoxide, Nitrogen oxides, Sulfur oxides.

Efforts in estimating the cost of air pollution damages are reviewed. National total annual costs of air pollution are developed. The costs for effects on health, vegetation, materials, residential property value, and tolling have been determined. Costs have not been studied for effects on animals and aesthetics. National total annual costs for 1968 are \$16.1 billion. This includes \$5.2 billion for residential property, \$4.7 billion for materials, \$4.1 billion for health, and \$0.1 billion for vegetation. The cost for each effect is distributed among the several pollutants considered responsible for that effect according to their relative emissions. The same cost is distributed among the sources by their relative emissions. No cost function relations could be developed for various levels of pollution. As a consequence, the pivotal functions of marginal benefit are precluded. The \$16.1 billion figure is a reasonable, conservative estimate. The subject of the cost of pollution would benefit from further effort in all aspects. (Author summary modified) APTIC-19599

ESTIMATES OF AIR POLLUTION DAMAGE TO VEGETATION - GUIDELINES FOR RESEARCH AND CONTROL.

Preprint, Air Pollution Control Association, New York City, 11p., 1970. 5 refs. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-19, 1970, Paper 70-104.)

Donald G. Gillette, and Thomas E. Waddell.

Identifiers: *Economic losses, *Plant damage, Area surveys, Control programs, Costs, Air quality standards, Crops.

Air pollution damage to vegetation is a serious problem in many major production areas in the United States. An outside regulatory force, which can effect pollution abatement, is needed to achieve control at an acceptable level. A prerequisite to any regulatory action is the need to define an acceptable pollution level. This can be done by applying an economic evaluation, in the form of cost-benefit analysis, to the problem. The assessed benefits are measured as the costs of pollution or the benefits that would be realized through pollution control. Such estimates may be used as indexes of the trends in the damage level and of the importance of various pollutants as damaging factors. Previous surveys of vegetation damage have been limited to certain areas or crops. The lack of standardized reporting practices and assessment techniques, however, has limited the value of such surveys. A more systematic and coordinated approach in assessing damage must be developed to provide a basis for comparing damages between production areas and to derive more meaningful estimates of damage. (Author abstract modified) APTIC-19659

IMPACT OF GASOLINE VOLATILITY AND OLEFIN REDUCTION ON THE REFINER.

For primary bibliographic entry see Field 02. APTIC-22358

SULFUR RECOVERY IN THE MANUFACTURE OF PIPELINE GAS FROM COAL.

For primary bibliographic entry see Field 02. APTIC-22632

TAKING THE LEAD OUT OF PETROCHEMICALS.

Oil Gas J., 68 (36):115-119, Sept. 7, 1970. 2 refs. Franklin F. Frederick.

Identifiers: *Socio-economic factors, *Gasolines, *Mathematical modeling, *Tetraethyl lead, Petroleum refining, Automotive emission control, Octanes, Olefins, Aromatic hydrocarbons.

A model was designed to study the transition to an unleaded octane and its effect on the business environment. At one extreme, significant impact would be felt by the automobile manufacturers, at

the other it would be felt most strongly in the refining and petrochemical industry. One of these is a condition which represents a decrease in the octane requirements of the automobile population, while the other extreme would require continuing production of octane quality to satisfy the present car population. At very high octanes, most of the current octane contributors cease to be effective when blended without lead. The most notable is butylene alkylate. Ethylene alkylate has a high octane but generally is sufficiently more expensive than aromatics so as to be uneconomical. The net effect of lead removal with high octane demand is the reduction of aromatics to petrochemical while increasing the availability of olefin plant feeds. Five cases are analyzed and summarized when the model of an integrated fuels-petrochemical refinery was used to examine the influence of lead elimination on the long term economic outlook. APTIC-22834

TIME TO RETHINK SULFURIC SOURCES.

Chem. Week, 102 (19):35-36, May 11, 1968.

Personal Author Not Recorded.

Identifiers: *Costs, *Pyrites, *By-product recovery, *Sulfuric acid, Mineral products, Calcium sulfates, Sulfur compounds, Hydrogen sulfide.

Slightly more than a year ago, engineers agreed that while chemical process technology is readily available to make sulfuric acid from pyrite concentrate or gypsum, the methods could not compete economically with sulfuric from elemental sulfur. However, the handicaps associated with pyrites and gypsum are beginning to disappear, now that the price of sulfur is \$42 per long ton. Total plant investment costs are compared on the basis of 400,000 short tons of acid per year produced from brimstone, pyrite, and gypsum. For each method, the total plant investment is equal to 123% of the battery-limit costs. Total indirect costs are 16.6% of the entire plant investment. The economics of the gypsum process are expected to become more attractive with the development of a fluid-bed process for recovering sulfur from calcium sulfate in the form of waste gypsum. There are two steps to the process: first, dry gypsum is preheated in a fluid bed and the two moles of combined water are driven off at a temperature high enough to support combustion of residual hydrocarbons; secondly, the calcium sulfate is reduced in a second chamber to calcium sulfide at approximately 1560 F. The latter is recovered as a suspension in water, where it is carbonated with carbon dioxide gas to yield calcium carbonate and also sulfur in the form of hydrogen sulfide gas. The gas is burned with air to form the sulfur dioxide gas feeding the sulfuric acid plant. APTIC-23048

AT-SPOUT MELTING COSTS IN GRAY IRON FOUNDRIES-1968.

American Coke and Coal Chemicals Inst., Washington, D. C., Sp., 1968.

Eugene M. Hinz.

Identifiers: *Primary metallurgical processing, *Costs, *Iron, Cupolas, Electric furnaces, Control equipment.

Operations of 79 gray iron foundries - 60 with cupolas and 19 with electric furnaces - were analyzed for Jan. 1 through Dec. 31, 1968 to determine melting costs. Cupola melting costs for 1968 averaged from 7% to 19% lower than those for electric, depending on foundry size. While overall foundry costs rose about 7%, cupola melting costs dropped more than 2%, and electric melting costs in most cases edged up a fraction of a cent. However, electric fuel costs alone were 165% higher than those for cupola fuel last year. Pollution control costs for electric furnaces tended to be somewhat lower than those for cupolas, adding from .39 to 3.4% per CWT hot metal as compared to 1.8 to 5.3% per CWT hot metal, respectively. The average cupola required 69% less maintenance capital than did the average electric furnace, and the average electric furnace required 33% greater labor and supervisory

investment per CWT hot metal than did the cupola. (Author summary modified) APTIC-23216

SITUATION ON THE MARKET OF AIR POLLUTION EQUIPMENT CONTROL.

(Markt und Absatzlage für Luftreinhaltungsanlagen). Text in German. Wasser Luft Betrieb, 14 (5):199, May 1970.

Personal Author Not Recorded.

Identifiers: *Commercial firms, *Commercial equipment, *Control equipment, Germany, Industrial emission sources, Filters, Statistical analyses.

Air pollution control equipment is manufactured in West Germany by 100 companies with another 60 companies supplying filters in various forms, test equipment for gas analysis, dust measuring equipment, and spray diffusers. Potential customers for such equipment are mining enterprises of all kinds, chemical factories of many kinds, wood processing plants, communal and regional power plants, gas works, incinerators, the leather manufacturing industry, the metal industry including smelting plants, coating plants, foundries, steel and iron works, the food industry, the tobacco industry, the glass, ceramic, stone, cement, brick, lime and related industries, the textile industry, the paper, cellulose, cork, linoleum and many other industries. Statistics of domestic manufacture and of imports and exports of such equipment have been compiled only since 1967; domestic production amounted to approximately \$37.25 mil in 1968 and to \$26.20 mil for the first half of 1969. Separate statistics and being kept for air filter equipment, dust extractors, waste gas purification equipment, and small dust arresters. APTIC-23336

11. STANDARDS AND CRITERIA

AIR POLLUTION AND THE PROBLEM OF SULFUR IN FUELS.

For primary bibliographic entry see Field 02. APTIC-19456

SULPHUR OXIDE STANDARDS.

Text in Japanese. Japan J. Hyg. (Tokyo), 24 (5-6):463-471, Feb. 1970. 24 refs.

Hikaru Shoji.

Identifiers: *Air quality standards, *Sulfur oxides, Air resource management, Air quality criteria, Governments, Legislation, Standards, Japan.

According to the public nuisances act enacted in Japan in 1967, the government is obligated to establish environmental standards with regard to air pollution, water contamination, and noise. The standard for sulfur oxides was established by the government in 1969, but procedures leading to the enactment of this standard were examined and found unsatisfactory for the protection of the people's health. Threshold values which were submitted by the technical committee on Environmental Standards were derived from the epidemiological research, and were determined to be the minimum requirement for health protection. Standards for sulfur oxides were established by the committee of Living Environment under the pressure of private enterprises. This standard was inconsistent with the recommendations, while the limiting values of the standard expressed by percentile were discrepant after being statistically researched from the data of Osaka and Amagasaki cities. It is suggested that scientific circles establish criteria and standards for each kind of pollution independently of governmental authorities. (Author abstract modified) APTIC-19806

EXHAUST EMISSION CONTROLS OF U.S.A. AND EUROPE.

(Obi ni okaru haikigasu taisaku). Text in Japanese. Koki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 8 (2):18-26, June 1970. 4 refs.

Takashi Kobayakawa.

Identifiers: *Europe, *United States, *Automotive emission control, *Tetraethyl lead, Japan, Particulates, Smog, Industrial emission sources, Domestic heating, Exhaust systems, Process modification, Meteorology, Hydrocarbons, Carbon monoxide, Nitrogen oxides, Photochemical reactions.

Smogs essentially fall into two different categories. London type smog has little to do with automobile exhausts and is the combination of household and industrial smoke plus fog. On the other hand, the smog characteristic of Los Angeles is mainly due to automobile emissions and is known as photochemical smog. The two types of smog are compared according to meteorological, seasonal, diurnal conditions, and their main sources. Various emission standards of the state of California are listed for carbon monoxide, hydrocarbons, nitrogen oxides, and smoke emissions, in addition to future control programs. Although smog in Japan and Europe falls into the London type, the significance of carbon monoxide is being recognized in large cities such as Paris and London. Nitrogen oxides are also demanding attention, but further research is yet to be conducted in Japan. Different emission standards for automobiles are listed and compared for the United States, Japan, and Economic Commonwealth of Europe. Another important component of air pollution from automobiles is particulates arising from the lead additives in gasoline. It has come to be recognized by the automobile manufacturers in the United States that the removal of lead additives would contribute to abatement with respect to the following points: the effectiveness of catalysts for removing carbon monoxide and hydrocarbons will be prolonged; manifold reactor life will be extended; the effectiveness of exhaust recycling system will be boosted; and other benefits such as avoiding the formation of lead salts will be gained. In connection with the above, several different types of exhaust treatment systems are introduced by means of block diagrams. Other methods of powering automobiles are considered, such as electric and steam engines, but they are still much underdeveloped. The present attempts by European countries to abate automobile exhaust pollution, especially the visible black smokes and obnoxious odors, are discussed.

APTIC-19808

EXPLANATION AND EVENTUAL ACHIEVEMENT OF THE 'ENVIRONMENTAL STANDARD CONCERNING CARBON MONOXIDE.'

(Issankatanso no kankyokujin 'no kaizetsu to tassei eno hoko'). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 8 (21)-9, June 1970.

Identifiers: *Carbon monoxide, *Air quality standards, Maximum allowable concentration, Japan, Tokyo, Automotive emissions, Automobiles, Measurement methods, Continuous monitoring, Infrared spectrometry.

Carbon monoxide problems have steadily gained importance in Japan, and the 'environmental standard concerning carbon monoxide' was established by Cabinet meeting in Feb. 1969. It differs from the standard of other countries in that it is based on the philosophy of maintaining the CO pollution at or below a certain level in order not to destroy the health and environmental life of the citizens, but keeping in pace with the economic progress of the country. The standard is not strictly a legally enforceable entity and is less stringent compared to the USSR for example, where the standard is based on an entirely different basis. A committee of various specialists filed a report on their findings concerning CO in terms of concentration, health and physiological effects, and measurement methods and places, which eventually became the basis of the new environmental standard. The standard specifies that the CO concentration be maintained at the hourly average of 20 ppm over an eight-hour period, or 10

ppm per hour over a 24-hour period. Measurement is to be conducted using a nondispersive infrared analyzer (NDIR), and other legal and technical specifications for automobiles and traffic conditions are given. The new standard is compared to the existing levels of CO at various locations in Tokyo and pertinent data are presented. Various methodologies and conditions for effective continuous monitoring are also suggested. Special emphasis is given to the improvement of exhaust gases as a whole, since the elimination of CO alone leads to an increase in nitrogen oxide emissions.

APTIC-19900

OPINIONS CONCERNING THE ENVIRONMENTAL STANDARD FOR SULFUR DIOXIDE RECOMMENDED IN THE HEARING BY THE ENVIRONMENTAL HEALTH COMMISSION.

(Seikatsukankyo shingikai toshin 'Iwo sankabutsu no kankyokujin' ni taisuru iken). Text in Japanese. Japan Assoc. of Chemical Industries, Tokyo, Oct. 11, 1968, 6p.

Identifiers: *Sulfur oxides, *Air quality standards, Hearings, Public affairs, Japan, Chemical processing.

The official statement by an association of 36 major chemical industries protests the environmental standard for sulfur oxides recommended by the Environmental Health Commission of the Ministry of Health and Welfare on July 15, 1968. The standard is suggested at the hourly average value of 0.1 ppm maintained for 88-93% of the total number of hours during a year. It is the opinion of the Association of Chemical Industries that the standard is too stringent and is technically not feasible without an enormous subsidy from the national government to alleviate the heavy burden on the industries. The standard also contradicts the philosophy behind the Law Concerning Public Nuisance of 'harmony with healthy economic growth.' It has yet to be determined precisely what relationships exist between human health and pollution from sulfur oxides, and the standard is therefore based on doubtful grounds. The Association recommends the hourly average value of about 0.3 ppm in view of the more realistic standards established in other countries. A list of environmental standards for Japan, the United States, and some European countries is included.

APTIC-22135

AIR POLLUTION CONTROL MEASURE.

(Taikiosen Taisaku). Text in Japanese. Doboku Gakkaishi (J. Japan Soc. Civil Eng.), 55 (2): 34-37, Feb. 15, 1970.

Identifiers: *Air quality standards, Abatement, Administration, Emission standards, Japan.

There are two principle administrative measures for controlling air pollution in areas where industries are highly concentrated. The first involves the determination of ambient standard based on scaling of pollutant density and includes indications of the frequency with which pollutants exceed the standard. The second measure is the determination of an emission standard referring to emission density and emission quantity standards. Though each pollutant can be limited by an ambient standard, the total amount of pollutants can be substantial. Consequently, in a country like Japan, where residential and industrial areas are intermingled, air pollution control which relies on only an ambient standard may have a nominal effect. On the other hand, ambient standards appear effective enough in Europe as long as pollutants remain within certain levels and provided the standards are supported by continuous measurements of pollutants. Under these conditions an ambient standard can imply tolerance limits. It is noted, however, that the primary goal of ambient standards should be the protection of public health. This means that they cannot merely indicate the tolerable levels of pollutants.

APTIC-22147

A MATTER OF 'DEFINITIONS'.

(Zur Thema 'Begriffsbestimmungen'). Text in German. Schriftenreihe Vor. Wasser Boden Lufthyg. (Berlin), no. 33:143-147, 1970. 8 refs.

Identifiers: *Standards, *Germany, France, Great Britain, Italy, Sweden, Particulates, Dust fall, Ringelmann chart, Monitoring, Inversion.

A report is given on the progress of standardizing definitions in the field of air pollution, in terms of 4 languages. The American, British, and French definitions of 'air pollution' are given, plus an explanation of the usage of immission in Germany (5 different definitions), Sweden, and Italy. Technical meanings of a number of English terms are discussed: particle fall, control, survey, dust, grit, soot, airborne dust, suspended matter, smoke, fumes, flue gas, primary standards, dark smoke, black smoke, brown fume and brown fumes, discomfort threshold, soiling, staining, authorized fuel, downdraft, and downwash. Specific definitions are also given for such European terms as '24-hour inversion' and 'nontoxic dust fall', the latter including a tabulation of allowable percentages for various substances.

APTIC-22329

FEDERAL MOTOR VEHICLE EMISSION GOALS FOR CO, HC AND NO (X) BASED ON DESIRED AIR QUALITY LEVELS.

J. Air Pollution Control Assoc., 20 (8):519-524, Aug. 1970. 19 refs.

Identifiers: *Emission standards, *Automotive emissions, Mathematical analyses, Hydrocarbons, Carbon monoxide, Nitrogen oxides, Photochemical reactions.

Based on the Department of Health, Education and Welfare's issued and planned air quality criteria documents, maximum values consistent with health-related criteria have been established for carbon monoxide, photochemical oxidants and nitrogen oxides. They are, respectively, 9 ppm g/cu m (eight hours), 0.06 ppm (one hour), and 0.10 ppm (one hour). While a simple roll-back technique could be applied to these concentrations to calculate needed automobile emission reductions, the technique has one disadvantage. It assumes a linear correlation exists between the severity of the oxidant index and reactive hydrocarbon emissions to the atmosphere. Photochemical alterations involving atmospheric hydrocarbons are too great to permit such an assumption, and the role of nitrogen oxides must be considered. What is needed to relate all these effects to emissions and their control is a validated model which incorporates atmospheric chemical mechanisms. In the absence of such a model, a modified roll-back calculation with a 1967 baseline was employed to derive the following emission goals: carbon monoxide, 6.16 g/mi; hydrocarbons, 0.14 g/mi; oxides of nitrogen, 0.40 g/mi. With respect to the control of oxidants, the most rational control strategy at this time is to control nitrogen oxides to achieve the desired health related air quality for nitrogen dioxide, and to rely on control of nonmethane hydrocarbons to achieve the desired oxidant air quality goal.

APTIC-22334

NATIONAL EMISSION STANDARDS FOR STATIONARY SOURCES.

J. Air Pollution Control Assoc., 20 (8):524-527, Aug. 1970. 5 refs.

Identifiers: *Federal governments, *Emission standards.

At present, there are no national emission standards in the United States for stationary sources. Implementation plans for meeting air quality standards in air quality control regions, as well as standards developed by state and local agencies, are essentially arrived at by negotiation between the federal and state or local agencies. True national standards are promulgated by the federal govern-

ment and are not subject to state or local negotiation. National emission standards are of two types: uniform or variable, population density, and state of industrialization. Where area discriminators such as present air quality, population or emission density are incorporated in a standard, it becomes a variable rather than a uniform standard. A variable national emission standard would include area discriminators allowing each jurisdiction in the United States to determine for itself whether it is agricultural, residential, commercial, or industrial. Whether the uniform or variable approach is used, the national emission standard should not be derived from air quality standards since such a procedure would entail prior enactment of state and local air quality standards. It is argued that national emission standards for stationary sources should be based on application of the best technology at the time of construction. With advances of technology in time, periodic revision of emission standards is implied to keep up with such progress. The problem of relating the standards to best control technology should be small compared to those created by having each jurisdiction develop a set of standards unique to itself. However, air quality standards would still be applied to the determination of allowable pollutant concentrations.

APTIC-22336

EFFECTS AND COUNTERMEASURES OF AIR POLLUTION INDUSTRIAL PRODUCTS AND MEDICINE.

For primary bibliographic entry see Field 02.

APTIC-22530

HYGIENIC ASSESSMENT OF TETRAHYDROFURAN AS AN ATMOSPHERIC POLLUTANT.

(Gigienicheskaya otsenka tetragidrofurnaa kak zagryaznatelya atmosfornogo vozdukh). Text in Russian. *Gigiena i Sanit.*, no. 5:16-19, 1970. 7 refs. V. A. Popov.

Identifiers: "Planning and zoning, "Maximum allowable concentration, "Toxic tolerances, Rats, Adults, Nervous system, Thresholds, User, Chemical processing, Ethers.

Using gas chromatographic methods, it was established that the normal level of detection of tetrahydrofuran (THF) by smell is 0.27 mg/cu m with threshold at 0.18 mg/cu m. Electrocardiac reflex tests on three humans showed altered activity at a THF concentration of 0.25 mg/cu m, but no effect at 0.15 mg/cu m. Hence, 0.2 mg/cu m is suggested as a maximum allowable single-incident concentration. Three-month continuous exposure of rats to THF at 0.2, 2, and 20 mg/cu m indicated an average daily maximum allowable concentration of 0.2 mg/cu m to be safe. Emissions from plants producing 100 and 400 tons of THF per year were studied. In the first case THF pollution was negligible, but the larger plant produced concentrations well above 0.2 mg/cu m for distances exceeding 75 meters. A 100-meter sanitary protection zone is recommended for such a plant.

APTIC-22534

ONTARIO'S AIR POLLUTION INDEX AND ALERT SYSTEM.

J. Air Pollution Control Assoc., 20 (9):612, Sept. 1970.

L. Sheinfeld.

Identifiers: "Air pollution episodes, "Air quality standards, "Ontario, Air quality measurement programs, Control programs, Advisory services, Alerts, Control agencies, Enforcement procedures, State governments, Canada, Particulates, Continuous monitoring, Sulfur dioxide.

An Air Pollution Index, designed to be readily comparable with the levels which are reached during air pollution episodes, was established by the Ontario Government in March 1970 to provide the public with a day to day knowledge of the pollution levels. Legislation authorizes the Minister of

Energy and Resources Management to order the curtailment or shutdown of any source not essential to public health or safety should the pollution reach the level which would be injurious to the health of the citizens in the community. The index is based on the continuous measurements of sulfur dioxide and suspended particulate matter.

APTIC-22824

CRITICAL REMARKS ON STACK HEIGHT CALCULATIONS ACCORDING TO THE 'TAUFT' REGULATION.

Staub (English translation from German of: Staub, Reinhaltung Luft), 29 (9):18-22, 1969. 10 refs. CFSTI: TT 69-55002/9

Walter Forweg, Gueseter Herberg, and Karlheinz Trobisch.

Identifiers: "Emission standards, "Stacks, "Height finding, Area emission allocations, Equipment standards, Germany, Dispersion, Sulfur dioxide.

Determination of stack heights is regulated in West Germany by the 'Technical Regulations for Air Pollution Control.' Critics of this regulation feel it leads to excessively high stacks. The sulfur dioxide emissions measured in the surroundings of an industrial plant are essentially lower than the emission maxima according to the regulation. Investigations carried out to check the height and frequency at which the theoretically expected emission maxima occur found that the emission maxima given by the regulation occur so seldom that they have no physiological significance. A proposal to alter the assessment of SO₂ ground load in emission zones is suggested in order to eliminate the present strict regulations as to the calculation of stack height, since they are obviously unnecessary. (Author abstract modified)

APTIC-22931

THE PERMISSIBLE LEVEL OF CARBON MONOXIDE IN INSPIRED AIR.

Scripps Institution of Oceanography, La Jolla, Calif., SIO Ref. 54-3, 10p., Dec. 29, 1953. 3 refs. CFSTI: DDC: AD 028055

Christian J. Lambertsen, and Willard Bascom.

Identifiers: "Controlled atmospheres, "Carbon monoxide, "Maximum allowable concentration, Humans, Occupational health, Toxic tolerances, Pressure.

A series of communications between the two authors in which a safe level of carbon monoxide inhalation is derived is documented. The communications were a result of a need for a carbon monoxide standard for SCUBA operations. In the absence of high-pressure data, available sea-level data were extrapolated to arrive at a figure of 38 ppm for a period of two hours as a rate at which no perceptible carbon monoxide poisoning symptoms would be likely to appear. On this basis, a working standard for compressed air to be used as breathing air by men working in SCUBA gear was established at a maximum of 20 ppm.

APTIC-23038

AIR QUALITY CRITERIA FOR BERYLLIUM AND ITS COMPOUNDS.

Contract N70m-291 (61), 14p., March 1, 1966.

Personal Author Not Recorded.

Identifiers: "Beryllium compounds, "Air quality criteria, "Toxicity, Acute, Chronic, Humans, Epidemiology, Health impairment, Bronchitis, Pneumonia, Dusts, Fumes, Mists.

Results of a study on the toxicity and hazards of beryllium and its compounds are presented, as well as recommendations for the establishment of air quality criteria. Acute and chronic effects of exposure to mists, fumes, and dusts of soluble beryllium compounds are discussed, including pneumonitis and bronchitis. The incidence of chronic disease is prevalent where brief exposures to high concentrations occur. A definite relationship exists between the chemical and physical prop-

erties of beryllium oxide as produced by calcining at different temperatures and its toxicity in animals. Methods for the analysis of beryllium are reviewed. A level of 0.01 micrograms/cu m for continuous exposure to beryllium is considered acceptable. Levels for several varieties of intermittent exposure are given. Further research in the pathogenesis and epidemiology of chronic beryllium disease is necessary.

APTIC-23077

DISCUSSION OF NATIONAL EMISSION STANDARDS FOR STATIONARY SOURCES PAPER BY PROFESSOR ARTHUR C. STERN.

Preprint, Air Pollution Control Association, New York City, 7p., 1970. (Presented at the Air Pollution Control Association, 63rd, Annual Meeting, St. Louis, Mo., June 14-18, 1970. Robert L. Harris Jr.

Identifiers: "Emission standards, Federal governments, Clean air act, Area emission allocations, Point sources.

A discussion of the Clean Air Act and current national emission standards is presented. Variable standards, embodied in the establishment of air quality regions, are recommended for existing stationary sources. Uniform emission standards are suggested for major new stationary sources, such as power plants, refineries, heavy industry, and so on. Uniform standards should require control of emissions to the minimum level; that is, to the best level of control consistent with available technology. Thus, the standards would become more stringent as technology improves. Pollutants which constitute an extreme hazard to health should be controlled uniformly. A discussion regarding the current status of national emission standards is included, and several major emission control bills now before Congress are mentioned.

APTIC-23080

CAUSE AND EFFECT: ASHRAE AIR CLEANER STANDARD 52-68 BENEFITS BOTH INDUSTRY AND THE CONSUMER.

ASHRAE (Am. Soc. Heating, Refriger. Aircond.

Engs.), 12 (9):44-45, Sept. 1970.

R. F. Logsdon.

Identifiers: "Dusts, "Ventilation, "Air conditioning equipment, "Equipment standards, Spot tests, Glass fabrics.

Test Standard 52-68 was developed to provide a basis for comparing the performance of air cleaning devices used in space ventilation and air-conditioning applications. Performance in dust removal ability is required to be given by both dust spot (atmospheric) procedure and by weight. For dust spot efficiency determinations, the standard substitutes a fine glass fiber mat for Whatman 41 filter paper. This provides a sampling target having better efficiency than the air cleaning devices under test. A standard injected dust is used for weight determinations. Another feature of the standard is that all critical requirements for test apparatus and equipment are specified. Whenever possible, the specifications are in terms of performance. The performance comparisons made possible by the standard are permitting the development of product standards and performance certification programs.

APTIC-23114

LECTURE ON PUBLIC NUISANCE. PART III. SO₂ GAS POLLUTION CONTROL. 1.

(Kogai boshi kozo. 3. Dainiko Arysungau taisaku. jo). Text in Japanese. *Netou Kanri* (Heat Management: Energy and Pollution Control), 22 (8):37-46, Aug. 1, 1970.

Masao Shidara.

Identifiers: "Maximum allowable concentration, "Emission standards, "Stack gases, "Stacks, "Sulfur dioxide, Japan, Europe, United states, Steam plants, Mathematical analyses, Altitude, Dispersion, Atmospheric movements, Stability (atmospheric).

The maximum allowable concentrations and the percentile expression of environmental emission standards of sulfur dioxides are explained and compared with emission standards in the United States and other European countries. Mathematical formulae are given for calculating the effective height of smokestacks (Bosanquet's formula) and the ground surface concentration of pollutants at distances x , y from a stack (Sutton's formula). Various emission standards calculated by using the above formulae are given for the eight classes of designated pollution areas, the first class having the most stringent maximum allowable concentration (0.020 ppm). Such areas consist of parts of Tokyo, Kanagawa, Osaka, Mie, and Hyogo. One method of mitigating the air pollution from stacks is the construction of stacks with heights in the order of 200 m to disperse the pollutants in the upper atmosphere. A table of power generating stations with the corresponding stack heights is presented. Stack height must be determined in relation to down-draughts, down-wash, inversion layers, and the maximum allowable concentration. Different types of stacks are introduced and their merits and demerits are explained.

APTIC-23163

NEW TEST METHOD, CERTIFICATION TO UPGRADE AIR FILTRATION.
Heating, Piping, Air Conditioning, 42 (10):83-85, Oct. 1970.
Richard A. Matthews.
Identifiers: *Equipment standards, *Filters, Dusts, Ventilation.

A new standard method for rating all general ventilation filters measures the following performance properties: initial resistance; initial atmospheric dust spot efficiency; average atmospheric dust spot efficiency if over 20%; final or upper and lower operating resistances; average synthetic dust weight arrestance; dust holding capacity; and renewed performance values of resistance, efficiency, and arrestance (when applicable for cleanable filters). The test method is much more comprehensive than any previous single test method, and test values will replace all previous test values for general ventilation filters. In combination with a new certification program, the method will go a long way toward guaranteeing filter performance to the user and designer and toward clarifying the value and benefits of good air filtration.

APTIC-23335

12. LEGAL AND ADMINISTRATIVE

ESTIMATING MANPOWER NEEDS OF AIR POLLUTION CONTROL AGENCIES.
Preprint, Air Pollution Control Association, New York City, 22p., 1970. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-17, 1970, Paper 70-92.)
George William Walsh, and Darryl J. Von Lehmden.
Identifiers: *Control agencies, *Personnel, Administration, Data-handling systems.

Executives, administrators, and planners of air pollution control agencies are concerned with the preparation of manpower estimates for budget requests, development of recruitment plans, and other processes. A discussion of a manpower model is presented that was designed to supplement other approaches to estimating manpower needs. The model, based on the major functions that a comprehensive control agency must perform to control or prevent air pollution, is dependent upon four readily available characteristics of the agency's jurisdictional area to provide primary estimates for four key functions: air monitoring, scheduled inspections, field patrol and complaint handling, and operation of a permit system. Discussion is also provided on factors that can effect model estimates and verification of results. (Author abstract)

APTIC-19406

METHODS OF MEASURING DUST CONTENT IN STACK GASES.
Japanese Industrial Standard JIS Z 8808, 34p., June 1963. 4 refs. Translated from Japanese. Belov and Associates, Denver, Colo., 67p., Jan. 28, 1970. Personal Author Not Recorded.
Identifiers: *Legislation, *Standards, *Measurement methods, Japan, Stack gases, Dusts, Gas sampling, Stack sampling.

A method for sampling and measuring the dust and moisture content of industrial stack gases is established by Japanese public law. Conditions are specified for location for obtaining sample, method of sampling, and methods of analysis. A comprehensive discussion provides the history of the development of the standard as well as details of application.

APTIC-19408

PROGRAM OF THE NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES.
National Cancer Inst., Bethesda, Md. and Atomic Energy Commission, Oak Ridge, Tenn., Proc. Conf. Inhalation Carcinogenesis, Gatlinburg, Tenn., 1969, p. 499-508. (Oct. 8-11.)
W. W. Payne.
Identifiers: *Plans and programs, *Research institutes, Laboratory animals, Humans, Epidemiology, Breathing, Health impairment, Research programs.

The National Institute of Environmental Health Sciences is located in Research Triangle Park, North Carolina. Proximity to the three universities forming the Triangle makes possible a number of cooperative research and training ventures. The mission of NIEHS is to determine and evaluate the health hazards of chemical, physical, and biological agents in the environment. Through identification of the mechanisms in adverse response, criteria for protective or preventive measures can be established on a scientific basis. Experimental data, clinical studies, and epidemiological observations are being developed into a structured, coordinated program to determine the pathogenesis of adverse effects and to evaluate exposure in relation to these effects. A program of epidemiology and biometry is being developed. The effects of environmental agents in small animals and various in vivo and in vitro systems are being studied under the full range of medical, biological, and physical sciences. An important but as yet undeveloped aspect of the program is the study of inhalation or whole-body exposure to toxic environmental agents: investigations by such means will be possible when expanded facilities are complete. (Author abstract modified)

APTIC-19664

SULPHUR OXIDE STANDARDS.
For primary bibliographic entry see Field 11.
APTIC-19806

AIR CONSERVATION LITERATURE - HOW IT IS OBTAINED, EVALUATED, AND PUT TO USE.
(Die Literatur ueber Reinhaltung der Luft - ihre Erfassung, Auswertung und Nutzbarmachung). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:359-366, 1970.
W. Seidl.
Identifiers: *Data-handling systems, *Research programs, Advisory services, Education, Technical societies, Germany.

As is true for scientific disciplines in general, there has been a 'literature explosion' on the subject of air pollution control. The USA is far in the lead in the production of such literature, followed by the USSR, West Germany, England, France, and Italy. Other countries were contributing about 10% of the literature, as of 1963. The VDI (Society of German Engineers) began an air pollution documenta-

tion service in 1957. The storage unit now contains better than 40,000 titles and over 230,000 card entries, arranged on a 3-track system in terms of type of pollution, emission source, and main subject. A description is given, with illustrative examples, of the manner in which material is stored and retrieved.

APTIC-19920

FUNDAMENTAL LAW CONCERNING THE CONTROL OF PUBLIC NUISANCES.
(Kogai taisaku kihonho). Text in Japanese. P.L. 132, 16p., July 22, 1967.
Personal Author Not Recorded.
Identifiers: *Abatement, *Legislation, *Japan, Governments, Water pollution.

A law is described which essentially clarifies the basic responsibilities of the national government and the regional public bodies in their effort to control public nuisances in order to protect the health of the citizens and to conserve their living environment in harmony with healthy economic growth. Public nuisances are defined as air and water pollution, noise and vibrations, sinking of the ground (except for mines), and obnoxious odors. Living environment consists of properties and animal and plant lives as well as their environments that have close connection with the living conditions of human beings. In addition the Public Nuisance Control Commission directly attached to the Office of the Prime Minister is established by the law, with the basic responsibility of investigating and discussing the fundamental issues relating to the control of public nuisances at the request of the Prime Minister.

APTIC-22132

REGULATIONS CONCERNING THE ENFORCEMENT OF THE AIR POLLUTION CONTROL LAW.
(Taiki osen boshiko shikokisoku). Text in Japanese. Ministerial Ordinance 2 of the Ministries of Health and Welfare and International Trade and Industry, 22p., Nov. 30, 1968.
T. Sonoda, and E. Shina.
Identifiers: *Enforcement procedures, *Smokes, Regulations, Inspectors, Emission standards, Japan, Stacks, Sulfur dioxides.

Ordinance no. 2 establishes the regulations concerning the enforcement of the Air Pollution Control Law. Various technical specifications are made concerning the effective height of smoke stacks, the methods for measuring smoke emissions, and emission standards for sulfur oxides. In addition, formats are specified for forms used to report the building or altering of emission sources, emission conditions, accidents caused by pollution, and for various other reports and applications. Sections concerning the legal power of the government pollution investigators are also cited.

APTIC-22133

SPECIAL LAW CONCERNING THE ASSISTANCES AFFORDED TOWARD HEALTH DAMAGES DUE TO PUBLIC NUISANCES.
(Kogai ni kakawaru kenkohigai no kyuusai ni kansuru tokubetsu sochihoo). Text in Japanese. P.L. 90, 18p., Dec. 2, 1969.
Personal Author Not Recorded.
Identifiers: *Costs, *Legislation, *Health impairment, Governments, Humans, Japan.

The law, effective as of Feb. 1, 1970, provides medical assistance (doctor's fees, drugs, surgery, hospitalization, nursing care) to those whose health is damaged by wide-spread air or water pollution due to entrepreneurship and activities of other persons. The areas covered by law are to be appointed by government ordinance. Medical expenses are provided by the local governments that are responsible for the appointed areas, and a part of such expenses will be sustained by non-profit public nuisance control organizations that are appointed by the Ministers of Health and Welfare

and of International Trade and Industry. The organizations in turn collect funds from the various enterprises concerned.
APTIC-22134

ORDINANCE TO ENFORCE THE AIR POLLUTION CONTROL LAW.

(Taikiosen boshio shikorei). Text in Japanese. Government Ordinance 329, 19p., Nov. 30, 1968. Eisaku Sato, Y. Nakasone, E. Shiina, and T. Sonoda.
Identifiers: *Enforcement procedures, *Smokes, Abatement, Enforcement procedures, Japan, Urban areas, Industrial emission sources, Vehicles.

Ordinance No. 329 was established to enforce the Air Pollution Control Law. Emission sources of smoke and air pollution to which the law is applicable are tabulated, ranging from boilers to incinerators, and the legally applicable sizes and characteristics of each are specified. The 24 substances considered harmful are listed, and include ammonia, hydrogen fluoride, hydrogen cyanide, and formaldehydes. Carbon monoxide from automobile exhaust gas is also specified under a separate category as an air pollutant. The procedures for mediating disputes over air pollution are also listed, while the 'appointed areas' to which the Air Pollution Control Law is applicable are enumerated in detail. They include all or part of Yokohama, Kawasaki, Niigata, Nagoya, Osaka, Sakai, Kobe, Himeji, Amagasaki, Kita-Kyushu, and Omuta.
APTIC-22136

LAWS AND ORDINANCES CONCERNING THE REMOVAL OF PUBLIC NUISANCES AND THE DATES ON WHICH THESE LAWS AND ORDINANCES WERE ESTABLISHED.

Text in Japanese. 4p., 1969 (*).
Personal Author Not Recorded.
Identifiers: *Legislation, *Regulations, *Japan, Abatement, Trade associations.

The laws and ordinances passed by the Japan government concerning public nuisances such as air pollution and noise are listed. Other literature issued by the Japan Association of Chemical Industries concerning the laws and ordinances is tabulated.
APTIC-22137

ORDINANCE TO AMEND PARTS OF EMISSION STANDARD FOR APPOINTED AREAS BASED ON THE REGULATIONS OF AIR POLLUTION CONTROL LAW.

(Taiki oson boshi ho no kitei ni motozuku shiteichiki N°1 "kakza" waru haishutsukijun no ichibu o kaisei). Text in Japanese. Ministerial Ordinance 2, 3p., July 29, 1969. N. Saito, and M. Ohira.
Identifiers: *Legislation, *Maximum allowable concentration, *Japan, Abatement, Governments, Legal aspects, Sulfur oxides.

Parts of the Ministerial Ordinance 2 of Nov. 1968 are amended. The emission standard for sulfur oxides in Article 1 is to be calculated by setting the value of K at 5.26 in the formula. Further rewordings are given for the same article, and the alterations with respect to the list of areas specified in Table 2 Nos. 7, 11, 12 and 13 are presented.
APTIC-22139

ORDINANCE TO PARTIALLY AMEND AIR POLLUTION CONTROL LAW ENFORCEMENT ORDINANCE.

(Taiki oson boshio shikorei no ichibu o kaisei suru seirei). Text in Japanese. Government Ordinance 24, 3p., March 17, 1969.
Personal Author Not Recorded.
Identifiers: *Enforcement procedures, *Legislation, *Japan, Abatement, Governments, Legal aspects, Maximum allowable concentration, Sulfur oxides.

An addition is made to Article 4 of the Ordinance to Enforce Air Pollution Control Law. The maximum allowable concentration of sulfur oxides in the atmosphere is limited to the hourly average of 0.2 ppm. In the case that the emissions exceed 0.2 ppm/hr for no more than 175 hours during a year, the limit would be set at 0.6 ppm/hr averaged over the total number of hours per year. The city of Kurashiki is added to the areas specified under Article 9, and other additions are appended.
APTIC-22140

EMISSION STANDARDS FOR 'APPOINTED AREAS' BASED ON THE REGULATIONS OF AIR POLLUTION CONTROL LAW.

(Taiki oson boshi ho no kitei ni motozuku shiteichiki ni kakawaru haishutsukijun). Text in Japanese. Ministerial Ordinance 2, 5p., Nov. 31, 1968. T. Sonoda, and E. Shiina.
Identifiers: *Legislation, *Emission standards, *Japan, Abatement, Regulations, Equipment standards, Soot, Stacks.

The exact formula used to calculate the emission standards for sulfur oxides is given in the ordinance. The formula depends on specific predetermined constants and the effective height of the emission source. For structures that cannot be built higher due to the hazard of aircraft landing and take-off (e.g., smoke stacks), special emission standards can be provided with the consent of the Ministers of Health and Welfare and International Trade and Industry. In addition, specific standards for soot and particulate emissions are given.
APTIC-22141

ORDINANCE TO ENFORCE A SPECIAL LAW TO PROVIDE ASSISTANCE TOWARD HEALTH INJURIES DUE TO PUBLIC NUISANCE.

(Kogai ni kakawaru kenkohigai no kyusai ni kansuru tokubetsusochi shikorei). Text in Japanese. Government Ordinance 319, 3p., Dec. 27, 1969. Eisaku Sato.
Identifiers: *Legislation, *Compensation, *Japan, Costs, Enforcement procedures, Governments, Codes, Public affairs.

Areas are determined by an ordinance to which the law to provide assistance toward health injuries due to public nuisance is applicable (specific sections of the cities of Kawasaki, Niigata, Yokkaichi and Osaka), and the types of illnesses peculiar to each area, such as asthma, chronic bronchitis, and lung edema. The list of legislations in conjunction with which the law takes effect are given, such as the Labor Standards Law, Maritime Workers Insurance Law, and Daily Laborer Health Insurance Law. The maximum amounts of medical cost covered by the assistance provided by the law are listed for different categories, and the administrative regulations governing the enforcement of the ordinance are provided.
APTIC-22142

AIR POLLUTION CONTROL LAW.

(Taiki oson boshio). Text in Japanese. P.L. 97, 19p., June 10, 1968.
Personal Author Not Recorded.
Identifiers: *Abatement, *Legislation, *Japan, Enforcement procedures, Governments, Air quality standards, Emission standards, Engine exhausts, Combustion gases, Dusts, Soot, Fly ash, Fumes, Smog, Smokes, Fuels, Automobiles, Sulfur oxides.

A law is presented which is designed to protect the health of citizens and to conserve their living environment with respect to air pollution. In addition, the law provides for mediation and eventual solution of disputes arising from air pollution. The conservation of the living environment is to be conducted in harmony with healthy economic growth. The law specifically controls the amount of 'smoke' emitted from factories and business ac-

tivities and determines emission standards for automobile emission sources. 'Smokes' is defined as sulfur oxides resulting from combustion of fuels and the like, as well as soot and other particulates that arise from the use of electricity for combustion and heating of fuels and the like. The law also defines air pollution control ('appointed') areas, emission standards and automobile exhaust gases and lists other administrative regulations.
APTIC-22143

THE SURVEILLANCE OF CLASSIFIED ESTABLISHMENTS.

(La surveillance des établissements classés). Text in French. Pollut. Atmos. (Paris), vol. 12:28-32, May 1970. Quevaullier.
Identifiers: *Control agencies, *Enforcement procedures, *Industrial emission sources, Administration, France.

The expression 'atmospheric pollution' has been used in the nomenclature of classified industries only since 1958 in France. Before that time, terms such as odors, dust, harmful emissions, fumes, and vapors were used. Just as sanctions were levied against industries guilty of emitting fumes into the atmosphere then, today the Inspector of Industries is responsible for some 30,000 establishments; complaints are lodged with him and studied in his Department, and he is empowered by law to take appropriate action.
APTIC-22151

AIR QUALITY CONTROL.

(Ueberwachung der Luftgüte). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 33:159-175, 1970. Translated from English in: Mining Congr. J., Oct. 1968. John T. Middleton.
Identifiers: *Plans and programs, *Clean air act, Enforcement procedures, Federal governments, State governments, Senate hearings, Standards, Cements, United states, Fertilizer manufacturing, Mineral processing, Ringelmann chart, Phosphates.

The Commissioner of the National Air Pollution Control Administration is interviewed concerning the work of his organization. He describes projected plans of the organization, dangers that must be given priority in the study programs, the responsibility of state governments in settling limits to define air quality, the importance of meteorological and topographical factors, the division of the country into air pollution control zones, aid from private organizations, governmental committees working in this area, the role of industry, some special problems of the cement and phosphate industries, the use of the Ringelmann scale, and the activities of Senator Muskie at the congressional level.
APTIC-22330

PESTICIDE RESIDUES IN THE TOTAL ENVIRONMENT: RELIABLE DETECTION AND DETERMINATION, MITIGATION, AND LEGISLATIVE CONTROL AND SURVEILLANCE PROGRAMMES.

For primary bibliographic entry see Field 03.
APTIC-22338

EXCERPTS FROM THE WELCOMING ADDRESS OF THE DIRECTOR, INSTITUTE OF WATER, SOIL, AND AIR SANITATION, FEDERAL DEPARTMENT OF SANITATION.

(Aus der Begrüßungsansprache des Leiters des Institutes fuer Wasser-, Boden- und Lufthygiene im Bundesgesundheitsamt). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 30:5-7, 1970. Fritz Hoeffken.
Identifiers: *Research programs, *Federal governments, Health impairment, Germany, Odors, Chemical processing, Food and feed operations, Automobiles, Sulfur oxides control, Diffusion.

The history of the Institute of Water, Soil, and Air Sanitation in West Germany is traced. As early as the 1920s it had initiated interdisciplinary cooperation in the study of air pollution, which brought together the combined gifts of chemists, medical scholars, biologists, a meteorologically trained physicist, and the German weather bureau. At present there are 3 important study groups presently being developed which are concerned with the following problems: effect of pollutants on humans and animals; diffusion of pollutants in the atmosphere (relating emission to immission, taking account of orographic and meteorological conditions); the origin of pollutants and their prevention. Among the major problems still confronting those engaged in air pollution control are the reduction of sulfur dioxide emissions, the elimination of unpleasant odors in the vicinity of chemical plants, fish meal factories, and plastic industries; and the problems created by automotive transportation. APTIC-22343

POLLUTION OPINION POLL.

Congressional Record, 1970:E7889-E7890, Aug. 21.

Edward I. Koch.

Identifiers: *Abatement, *Proposals, *New York city, City governments, Questionnaires, Automotive emissions, Water pollution.

Congressman Edward Koch's statement on his attempts to abate the air pollution crisis in New York City is reproduced together with the text of a questionnaire posing alternative steps that the congressman sent to his constituents. Representative Koch's efforts have been directed toward urging the Justice Department to invoke an 1899 law outlawing the discharge of refuse into navigable waters, introducing a Regional Water Quality Act that would establish a national system of tax levies on industrial polluters, and backing legislation that would permit New York to establish auto emission standards more restrictive than national standards. Opinions sought in the questionnaire concern bans on private vehicles and/or street parking in the congressman's district, the proposed enlargement of an area electric generating plant, the substitution of another mode of propulsion for the internal combustion engine, and the use of nonreturnable bottles. APTIC-22346

PROGRESS OF 'KOGAI' CONTROL AND PUBLIC OPINION (PART IV).

(Kogai taisaku no keisei to saron (seno IV)). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6 (7):495-501, July 15, 1970.

Jun Ui, Kyoichi Sonoda, and Nobuko Iijima.

Identifiers: *Abatement, *Enforcement procedures, *Legislation, *Japan, Administration, Citizens groups.

A discussion is presented of the legal requirements of Japanese-pollution control legislation, its economic and technical observance, and the history of the community movement directed toward the abatement of pollution. Originally, the position taken by the government was that, in the absence of specific legislation regulating pollution and polluters, the government had no power to act against either. When anti-pollution laws were passed as a political response to public indignation, their effectiveness was greatly reduced by commercial and industrial influence upon the Ministry of International Trade which had the responsibility of framing the legislation. Loopholes in the administrative aspects of the law forced persons suffering from abuses by others of the law to seek redress through the more effective civil action. This required the expenditure of large amounts of time and money by those who lacked both to obtain satisfaction from those who had both. While many cases were decided against the polluters, the formula for compensation was such that no satisfaction was ever awarded. The practical result of the law was to over-protect free enterprise. Much of the blame for this situation is at-

tributable to the unprecedented growth rate of Japanese industry. In addition, practices of pollution control were imported, principally from the United States, and were applied mechanically without allowance for the cultural, political, or economic environment in which they were being applied and, moreover, without the theoretical systems analysis of the Japanese situation. Diffusion of stack effluents was uncritically applied as the sole abatement procedure. Establishment of emission standards was based on the criterion of demonstrable monetary loss. Only those people in the immediate vicinity of a pollution source continued to press for improved conditions. The community movement will only become effective when it obtains broad-based popular support and a defined, realistic objective. APTIC-22349

LECTURES ON PUBLIC NUISANCE. CHAPT. 1 AIR POLLUTION PREVENTION (2).

(Kogai boshi koza. Dai 1 ko. Taiki osen boshi). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 22 (7):39-48, July 30, 1970.

Masao Shidara.

Identifiers: *Abatement, *Legislation, *Tokyo, *Control equipment, Costs, Air quality standards, Emission standards, Particulates, Vehicles, Particle size, Collectors, Centrifugal separators, Settling chambers, Electrostatic precipitators, Filters, Filter fabrics, Gravity settling, Inertial separation, Design criteria, Carbon monoxide.

The law designed to prevent air pollution in greater Tokyo is reviewed together with methods of controlling particulate and gaseous air pollutants. Tokyo is typical of heavily populated Japanese cities. The Air Pollution Prevention Law of Tokyo was issued in July, 1969. It consists of five parts: preamble, definitions, responsibilities, control of sources of environmental pollution, and the settlement of disputes on public nuisance. The removal of particulate air pollutants from their gaseous media can be accomplished by a number of mechanisms or forces, including gravitational, inertial, centrifugal and electrostatic. Commonly used devices mentioned are gravitational collectors, inertial collectors, centrifugal collectors, absorption equipment, sound-wave collectors, filters, and electric precipitators. Efficiency of these collectors depends on gas stream conditions and the characteristics of the pollutants. These factors must always be considered in the design and selection of equipment. The relevant characteristics of the particulate air pollutants are particulate size distribution, amount, composition, electrical properties, solubility in water, weight concentration, and adhesiveness. With regard to gas stream conditions it is necessary to know volumetric flow rate, temperature, humidity and composition. A graph showing the particulate size distribution, a table showing the characteristics of filter fabrics and their relative price, and tables showing collector design parameters are included. Also given are, the National Air Quality Standards for carbon monoxide, and the new, more stringent motor vehicle emission standards. Methods and techniques of removing and recycling gaseous pollutants that are extremely hazardous to health are briefly described. APTIC-22406

COUNTRY-WIDE EFFORTS TO PROTECT THE CLEANNES OF AIR.

(Országos erőfeszítések a levegő tisztaságának megóvása érdekében. Text in Hungarian. Energia Atomtech. (Budapest), 23 (5):200-202, May 1970. Ferenc Pikler.

Identifiers: *Abatement, Control agencies, Enforcement procedures, City governments, Federal governments, Regulations, Public affairs, Seasonal, Europe, Urban areas.

The quality of the air in Budapest and other Hungarian cities deteriorated recently, a phenomenon similar to developments abroad. The Hungarian

situation, however, is worse than the corresponding foreign state of affairs, especially during the winter months. Remedial work started more than 15 years ago, in the Aerosol Division of the Scientific Association for Power Supply. This voluntary work eventually led to official recognition; e.g., in Budapest, the City Council issued an Air Cleanliness Ordinance in 1962, at the initiative of the Association. By 1968, the anti-air-pollution activity became a national task and was placed under the auspices of the Minister for Construction and City Development. This Government agency is empowered to issue ordinances but it is next to impossible to carry out the ordinances: the control organs have neither personnel nor expertise. Even newly installed air cleaners and precipitators are bypassed or, in case of a malfunction, they are not repaired. Therefore, the first task is to persuade the public to help the enforcement of the laws already on the books. Next, the use of offensive energy carriers has to be made prohibitively expensive. Then national norms of emission will have to be established and the timetable of power generation will be worked out in accordance with the requirements of climatology. In general, the public has to realize, that air is a commodity in very short supply. The substitution of gas and oil to replace coal is inevitable. The press, radio and TV will have to be actively used. APTIC-22419

LEGAL ASPECTS IN THE INTERNATIONAL SYMPOSIUM ON ENVIRONMENTAL DISRUPTION. PART II.

(Közülmöndai kokusai shimpojumu ni okeru kogai no hoteki sokumen. Sono ni). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6 (7):491-493, July 15, 1970.

Michio Nishihara.

Identifiers: *Abatement, *Citizens groups, *Social attitudes, Federal governments, Local governments, Regional governments, Litigation, Complaints, Japan.

The actions by the citizens have been effective in gradually bringing about more control of public nuisances. Some of the important task for the future are the inclusion of the citizens' wishes and intentions in the resolution and mediation of disputes, and the way in which the independence of the citizens can be arranged in the perfection of administrative litigations. The institutional guarantee that directly reflects the wishes of the people in the nuisance control regulations themselves is also indispensable. In Japan, the direct participation of the people would be largely possible at the level of the regional autonomous bodies with respect to surveillance and the establishments of standards. There are many citizens' movements against public nuisances, and it is the future task for the lawyer-sociologists to examine in concrete terms the factors and circumstances that determine the materialization and the characteristics of such movements and the relationship between the movements and their results. Comments are made on the various concepts of 'environmental disruptions' that the Japanese and foreign scholars possess, the development of legal and administrative organizations dealing with nuisance problems, and the relationship between the national government and the regional autonomous bodies with respect to nuisance control legislations administrations, etc. APTIC-22532

COUNTERMEASURES TO AIR POLLUTION IN CITY PLANNING.

(Toshikeikaku ni okeru taiki osen taisaku). Text in Japanese. Kukichowa to Reito (Air Conditioning Refrig.), 10 (2):6-15, Jan. 15, 1970. 13 refs. Kazuo Hishida.

Identifiers: *Abatement, *Planning and zoning, *Combustion products, *Air pollution forecasting, Advisory services, City governments, Complaints, Japan, Urban areas, Automotive emissions, Particulates, Residual oils, Mathematical analyses, Line sources, Point sources, Meteorology, Winds.

Stability (atmospheric), Topographic interactions, Carbon monoxide, Nitrogen oxides, Sulfur oxides, Sulfur dioxide.

City planning was reviewed regarding local and general contamination. Sulfur oxides, auto-exhaust gas, and industrial exhaust gases are the main pollutants. Localized air pollution is the object of the inhabitants' complaints and its countermeasure is technical and economic guidance to factories causing trouble. General pollution relates to the energy policy and the local area development planning of the nation and is political and administrative in nature. The current situation of air pollution complaints in Tokyo was reported. Semi-industrial areas showed the most complaints because industrial and residential areas are mixed; industrial areas followed; and commercial areas complained the least. The comparison of the pollution in Yokkaichi city and in Tokyo Metropolitan Area was made. Sulfur dioxide contamination in Yokkaichi was mainly due to combustion of heavy oil. The investigation of pollution in Yokkaichi brought a new development in the planning of industrial cities, such as placing the sources sufficiently far away from residential areas. Elimination of the effects of down draught and down wash, and separation of dwelling or commercial area from industrial and semi-industrial regions by a green belt are the points of countermeasures to local contamination of air. Contamination in and around Tokyo led to the decentralization or concentration of pollution sources as a measure to the general pollution. Decentralization of industries into the suburbs reduces the amount of polluted matter exhausted per unit area, and the concentration of factories in a block enables the application of anti-pollution measures. The planning of energy arrangements and that of zone heating must be discussed as the anti-pollution means. Decreasing the mixing levels of a 'volume' area does not benefit pollution control. Research of meteorological phenomena and effects of topographical condition together with expected density of point pollution sources enables the determination of specific anti-air-pollution measures. The concepts of plane distribution and band distribution of pollution sources help the new type of anti-pollution administration.

APTIC-22539

THE FLUORIDE PROBLEM.

For primary bibliographic entry see Field 01.
APTIC-22547

AIR MONITORING: HOW MUCH IS ENOUGH?

Environ. Sci. Technol., 4 (9):723-724, Sept. 1970.
Personal Author Not Recorded.
Identifiers: *Air quality measurement programs, *Governments, Automatic methods, Monitoring.

Ever since the states and air quality regions were assigned the task of air pollution enforcement, there has been a proliferation of sophisticated monitoring and data telemetering networks. A recent study acknowledges some need for regional networks and a definite need for expansion of local (city and government) networks, but warns against accumulating 'data for data's sake.' The use of elaborate and extensive systems that provide for rapid response or telemetered data transmission is justified only when slower transmission modes are more expensive, or when action affecting the air quality of a region can be taken within hours after receipt of data. Development of local networks should not preclude an expanded federal air quality data bank and a nationwide statistical air monitoring network. A federal surveillance program would provide a uniform base against which all other data could be verified and, by developing new management techniques, permit local networks to concentrate on enforcement activities.

APTIC-22638

INTRODUCTION TO JAPANESE NATIONAL POLICY FOR PREVENTING PUBLIC NUISANCE.

In: Introduction of Environmental Problems. 25p., Feb. 1970.

Personal Author Not Recorded.

Identifiers: *Abatement, *Control programs, *Japan, Legislation, Industrial areas, Engine exhausts, Stack gases, Automobiles, Adsorption (general), Manganese dioxide (japanese), Diffusion.

The Japanese National Policy for Preventing Public Nuisance is outlined. The policy includes execution of air pollution control laws, a means of controlling automobile exhausts, the enforcement of various investigations, consolidation of services, expansion of inspection and measurement systems, and financing methods. Results of area surveys are useful in determining emission standards for industrial areas. Industrial plants responsible for sulfur dioxide are investigated. Diffusion data, based on wind, temperature, and other meteorological data, is needed. Wind tunnel tests simulating stack emissions are useful in studying plume behavior. Methods of controlling water pollution are given. Stack gas desulfurization by the activated manganese and the activated carbon method is discussed.

APTIC-22647

SO GOES SO2.

For primary bibliographic entry see Field 03.
APTIC-22656

AIR POLLUTION MONITORING IN THE NETHERLANDS.

(Il controllo dell'inquinamento dell'aria nei Paesi Bassi). Text in Italian. Inquinamento, 12 (4):40-42, 1970.

F. Hartogensis.

Identifiers: *Air quality measurement programs, *Control agencies, *Federal governments, *Local governments, *Legislation, Alerts, Regulations, Standards, Europe, Industrial emission sources, Vehicles, Domestic heating.

Dutch legislation that is applicable to air pollution control is reviewed. No specific air pollution laws exist at present, but a law of May 1952, revised March 1960, is directed against any industrial practice that causes or threatens damage or annoyance to the neighborhood in which a plant is located, or in which there are plans for its erection. Normally, air pollution control is the province of the local authorities, but in especially serious cases the national government can be called in. In 1968 an air pollution bill was presented to the Dutch parliament, the main advantage of its passage being the extension of air pollution control to nonindustrial sources. At the national level, the Ministry of Social Affairs and Public Health is the agency responsible for air pollution control, which collaborates with the Labor Department, Bureau of Mines, Ministry of Transportation, Water Control Board, and Department of Public Works. Maximum emission levels and chimney heights are determined to a large extent by standards developed in the USA and Germany. In January 1968 the State Institute for Public Health signed a contract with the Philips Electronics Industry to provide research equipment in this area, and an experimental system has been set up at Twenthe. Legislative machinery for dealing with pollution problems arising from domestic heating and motor traffic is especially inadequate at present. At the local level, some significant work has been done by the Rijnmond Authority, which has a network for the evaluation of SO2 concentrations and meteorological conditions, such that it can issue warnings to local industry when an air pollution crisis seems imminent. The rather decentralized condition of air pollution control in the Netherlands is rendered considerably more tolerable by the cooperation of industry and the citizenry.

APTIC-22657

BASIC LAW FOR ENVIRONMENTAL POLLUTION CONTROL.

In: Laws and Regulations for Environmental Pollution Control. 13p., Feb. 1970.

Personal Author Not Recorded.

Identifiers: *Abatement, *Legislation, *Japan, Administration, Costs, Enforcement procedures, Federal governments, Local governments, Planning and zoning, Personnel, Public affairs, Standards, Taxation.

Responsibilities under the law for environmental pollution control are established for enterprises, the State, and local public bodies. Environmental pollution is defined to include air pollution, water pollution, noise, vibration, ground subsidence, and offensive odors. The National Government is directed to establish environmental quality standards and to enforce their observance. Control of land use, industrial siting, and the establishment of pollution buffer zones are also responsibilities of the National Government. By law, enterprises shall bear, in whole or in part, the cost of abatement measures and the cost of repairing damage as a result of pollution for which they are responsible. An Environmental Pollution Control Council is established, chaired by the Prime Minister and consisting of Ministers of related ministerial organizations whose duty it is to administer the law. A Central Advisory Council for Environmental Pollution Control consisting of 20 experts in the prevention and abatement of environmental pollution is established. They are solely a consultant body responsible to the Prime Minister. The law also authorizes the formation of similar advisory councils by local public bodies. Taxation is authorized at the local, prefectural, and national level to support the implementation of the law. The law is considerably vitiated by the requirement that 'In the conservation of living environment, harmony with sound economic development should be considered.'

APTIC-22847

LAW CONCERNING PRESERVATION OF WATER QUALITY OF PUBLIC WATER AREAS.

In: Laws and Regulations for Environmental Pollution Control. 4p., Feb. 1970.

Personal Author Not Recorded.

Identifiers: *Legislation, *Japan, *Water pollution, Administration, Enforcement procedures, Federal governments, Standards.

The Law Concerning Preservation of Water Quality of Public Water Areas prescribes that the objects of the conservation of water quality of public use water areas should be 'the mutual harmony of industries' and 'the improvement of public health.' The expression of 'the mutual harmony of industries' is based on the consideration that the development of industries should not be hindered by too strict control of water quality. This Law prescribes that the Director of the Economic Planning Agency should establish the standards of water quality for each of the areas designated by the Director (called the designated water areas). A water area where 'the pollution of water has caused a considerable damage to industries related to the water area or caused an effect not to be overlooked from the viewpoint of public health or where there is a fear of such damage or effect' is designated as a designated water area. It is also prescribed that the fixed standards of water quality should not exceed the degree necessary for the remedy or prevention of the condition for which the designation is made. This expression is based on the consideration that the development of industries should not be prevented by too strict control of water quality. The designation of a designated water area and the decision of the standards of its water quality should be made only after the deliberation of the Water Quality Council. The water quality standards are the standards for the discharges water must comply with the water quality standards. However, this law has no penal provision against the negligence of the duty.

APTIC-22848

AIR POLLUTION CONTROL LAW.

In: Laws and regulations for Environmental Pollution Control. Ministry of Health and Welfare, Tokyo (Japan), P. L. 97, 50p. Feb. 1970. Personal Author Not Recorded.

Identifiers: *Abatement, *Legislation, *Japan, *Sulfur oxides, Administration, Control agencies, Criteria, Air quality criteria, Equipment criteria, Enforcement procedures, City governments, Federal governments, State governments, Litigation, Permits, Standards, Engine exhausts, Soot, Smokes.

Regulations are provided on exhausts of soot and smoke produced in the activities of industrial plants and on the allowable limits of gaseous exhausts from motor vehicles. Included in the law are procedures for the settlement of disputes resulting from air pollution. The law directs the Ministry of Health and Welfare and the Ministry of International Trade and Industry to provide emission standards applicable to designated areas. An area may be placed under control by directive from the Cabinet if it is or appears about to become an area 'teeming with smoke.' Relief from the Cabinet order may only be obtained by enactment legislation drafted by the Ministry of Health and Welfare and the Ministry of International Trade and Industry preceded by an opinion from the Governor of the Municipality, Hokkaido, or Prefecture concerned. Permits are required to install a new emission source in a control area. Inspection under the law and enforcement of this provision are imposed upon the municipality, Hokkaido, and prefecture. Penal provisions are incorporated in the law and include fines, imprisonment, or both. Cabinet Orders establishing substances as pollutants and placing limits upon them are incorporated into the law.

APTIC-22849

PLANT EFFLUENT LAW.

In: Laws and Regulations for Environmental Pollution Control. 12p. Feb. 1970. Personal Author Not Recorded.

Identifiers: *Industrial emission sources, *Water pollution, *Legislation, *Japan, Abatement, Administration, Enforcement procedures, Federal governments, Standards, Sewage treatment.

A person who intends to install or change a facility to be used for a manufacturing or processing purpose from which sewage or effluents are to be discharged into a designated water area (called a 'specific facility') must notify the competent Minister to that effect, and a person who intends to change the method of use of a specified facility or the method of treatment of the sewage or effluent must also notify the competent Minister to that effect. Within 60 days from the day he receives the notification, the competent Minister may, when he deems that the substance of the notification does not conform to the water quality standards, order the person to change the planned method of treatment or to change or abolish the plan to install or change the specified facility. After a specified facility or a sewage treatment facility is put to use, if the competent Minister deems that the water quality of the factory effluents does not conform to the water quality standards, he may issue an order to improve the method of treatment within the period he fixes, to temporarily suspend the use of the specified facility, or to take other necessary measures. Operators of specified facilities are required to maintain records of water quality measurements and to submit them for inspection to authorized persons. They may also be required to submit reports concerning the condition of the specified facility and means for improving the quality of the effluents. Penal provisions incorporated into the law include prison terms not to exceed one year and/or fines not to exceed 100,000 yen (approximately 350 dollars).

APTIC-22850

TRENDS IN THE REGULATION OF AIR POLLUTION.

Pacer, 1 (5):41-66, 1970. 9 refs.

Victor H. Susman.

Identifiers: *Abatement, *Air resource management, *Trends, Control programs, Criteria, Federal governments, Local governments, State governments, Legislation, Regulations, Standards.

Air management involves a number of steps in arriving at and implementing emission control standards: to establish air quality criteria, goals, objectives, and standards; to measure and evaluate ambient levels of air pollutants; to regulate the emission of pollutants; and to enforce regulations and evaluate program effectiveness. For purposes of engineering design and legal enforcement, it is necessary to establish objective numerical standards in terms of pollutant concentrations. Local municipal government programs can range from smoke control and the banning of open burning to a comprehensive program such as that in Los Angeles County, which is designed to control a wide spectrum of contaminants from smoke, dusts, sulfur dioxide, and odors to hydrocarbons and solvent vapors. Most state programs provide for assistance to and review of municipal programs; the conducting of studies on the extent and nature of air pollution; the adoption of rules, regulations, and standards; and inspection of air pollution sources and the enforcement of regulations. In 1963, Congress passed the Clean Air Act which authorizes the awarding of grants directly to state and local agencies to assist them in developing, establishing, or improving control programs.

APTIC-22971

CLEAN AIR LEGISLATION.

BCURA (Brit. Coal Util. Res. Ass.) Monthly Bull. 34 (6):148-152, June 1970. 41 refs.

P. G. W. Hawkey.

Identifiers: *Abatement, *Legislation, *Great Britain, Dusts, Fumes, Smokes, Sulfur dioxide.

The principal legislation relative to air pollution in Great Britain (not including Northern Ireland) is contained in the 1956 and 1968 Clean Air Acts; the 1964 Housing Act; the 1966 Alkali, etc. Works Regulation Act and the Statutory Orders under that Act consolidated in 1966; the 1936 and 1961 Public Health Acts; the Building Regulations 1965; the Motor Vehicles (Construction and Use) Regulations 1966; and the 1969 Public Health Recurring Nuisances Act. The literature on the legislation is discussed from the point of view of the implementation and effects of the laws. The emission of smoke is now fairly effectively controlled, although the current temporary shortage of smokeless fuels may result in a temporary setback if some smoke control orders are suspended. Pollution by grit, dust, and fume is less well controlled. At present, all that is required is that the best practical means be employed to minimize the emissions. This will probably remain a defense when statutory limits are prescribed, at least for existing furnaces. Nevertheless, the operation of the various Clean Air laws is steadily improving the environment. In London alone, smoke and sulfur dioxide concentrations have decreased by 80% and 40%, respectively, in 10 years.

APTIC-22984

THE PRESENT STATE OF POLLUTION IN JAPAN.

(Wagakuni ni okeru kōgai no genjō). Text in Japanese. Kikichōwa to Reito (Air Conditioning Refrig.), 10 (2):1-5, Jan. 15, 1970.

Michio Hashimoto.

Identifiers: *Legal aspects, Abatement, Federal governments, Local governments, Standards, Japan, Oxidants, Suspended particulates, Water pollution, Hydrocarbons, Cadmium compounds, Mercury compounds, Carbon monoxide, Nitrogen oxides.

Pollutions in Japan are reviewed from the social viewpoint as well as in relation to the situations before and after the passing of the Basic Public Nuisance Control Law and the existing state of contamination and the new understanding of health. The change of energy source from coal to

petroleum since 1955 produced new types of industrial pollution, and the high rate of economic growth also produced the urban pollutions. Contamination of Yokkaichi was the start of the present pollution problems, and it was followed by the investigations and the passing of several control laws. Enforcement regulations were completed and the emission limitations were strengthened. Local governments also established regulations. The establishment of the environmental standards was enabled by the Basic Law, and later the standard for sulfur oxides was passed. General noise and carbon monoxide pollutions are now being discussed as to their environmental standards, and standards for special types of noise, fine particles, hydrocarbons, oxidants, nitrogen oxides and exceptionally harmful substances are expected to be established. The Public Nuisance Control Plans are also under way together with the provisions for relief measures for pollution victims. Results of investigation of air pollution in 1968 are presented. Water pollution is also described in terms of methyl mercury and cadmium diseases.

APTIC-23116

WATER BALANCE, AIR POLLUTION CONTROL AND WASTE DISPOSAL.

For primary bibliographic entry see Field 02.

APTIC-23126

SYSTEMATIC PLANNING FOR ENVIRONMENTAL IMPROVEMENT.

Am. J. Public Health, 60 (7):1205-1212, July 1970.

Jerrold M. Michael.

Identifiers: *Plans and programs, *Federal governments.

The basic goal of the Consumer Protection and Environmental Health Service (CPEHS) is to protect every American against controllable hazards to health in his environment and in the products and services that enter his life. As a first step in carrying out this mission, CPEHS developed a long-range 'Strategic Plan' predicated on identification of specific environmental health problems, program goals, and program objectives. These are set forth in the document 'Strategy of the Consumer Protection and Environmental Health Service.' The Program and Financial Plan, an adjunct to the Strategic Plan, requires identification and quantification of major program outputs and the resources required to obtain them. The Operating Plan is a further exposition of the Strategic Plan, identifying in detail program operations for two-year time periods. Each of the three CPEHS administrations—Food and Drug, Environmental Control, and National Air Pollution Control—has prepared an annual Operating or Tactical Plan. The Operating Plan is characterized by a regular reporting process that permits continuing identification of program progress and identification of operating problems. In addition, programs are subjected to cost-benefit and cost-effectiveness studies.

APTIC-23134

A NEW POLITICAL APPROACH TO CONTROL PUBLIC NUISANCE.

(Kōgai-gyōsei no tachiba kara). Text in Japanese. Toho Igakkaish (J. Med. Soc. Toho, Japan), 16 (6):608-614, Dec. 1969.

Michio Hashimoto.

Identifiers: *Administration, *Control programs, *Socio-economic factors, *Sulfur dioxide, Legal aspects, Emission standards, Metal poisoning, Japan, Dusts, Mercury compounds.

The general discussion of public nuisance control is geared towards the implications of control laws and governmental involvement and responsibilities. The legal control of pollution problems must be performed systematically, since it concerns many ministries and agencies. Detailed explanations concerning how the sulfur dioxides environmental standard was established are given. The

threshold value is explained as is the academic definition of 'purity', and the environmental standard is designed toward the administrative aim of maintaining the threshold at a feasible level. The standard was declared to be impossible by the industrial and the business sector of the economy, but the ten-year plan attached to the standard was patterned after the plan of the Ministry of International Trade and Industry. Studying the relationship between pollution and public nuisance was difficult, and the opposition of the industries was based on the absence of firm evidences. This is the crux of future pollution control. In view of the present and past examples, the possibility of administration without complete scientific investigation is the key to pollution control. The difficulty of investigating public nuisance problems such as the methyl mercury poisoning in Minamata as well as the problems encountered in the course of the interaction of administrative-political and academic-medical decision-making are explained. APTIC-23145

ON THE UNEXPECTED AIR POLLUTION AND THE CONSIDERATION OF THE CAUSE. PART II. EPIDEMIOLOGICAL RESEARCH ON THE ODOR IN TOKUYAMA CITY.

(Toppatsuteki taiki oten to sono geninteki kosatsu. sono 2. Tokuyama-shi ni okeru shuki no ekigaku teki tsuikyū). Text in Japanese. Yamaguchi Idoi Sangyo Igaku Kenkyusho Nenpo (Ann. Report Res. Inst. Ind. Med., Yamaguchi Med. School), no. 16:225-227, 1969. 1 ref. Yoshikatsu Nose, and Yoshio Katagawa. Identifiers: *Questionnaires, *Odors, *Odor counteraction, *Tokuyama city, Enforcement procedures, Meetings, Complaints, Japan, Industrial areas, Rubber manufacturing, Odorimetry, Meteorology, Butadienes, Styrenes, Hydrogen sulfide.

In Tokuyama, a town of petrochemical industry, frequent odors have been the target of citizens' complaints. The geographical distribution of complaint frequencies determined by means of a questionnaire survey and wind speed and direction indicated that the odors originate from the eastern industrial complex. Despite the claim by industry representatives that the odors were the result of the secondary reaction of gases similar to photochemical events, the meteorological data showed that the odors were the result of direct emissions from the factories. Some of the most frequent descriptions of the odor are, indescribable, headaches, loss of appetite, eye irritations, nausea, sore throat, burning sulfur, and human waste. The geographical distribution of these descriptions indicated that the odorants consisted of butadiene, styrene, ethylene, hydrogen sulfide, and similar substances. The investigation results pointed to the factory of the N-rubber Co. and the odor was determined as butadiene and styrene. The odor problem was subsequently voluntarily rectified by the company. APTIC-23149

ON THE UNEXPECTED AIR POLLUTION AND THE CONSIDERATION OF THE CAUSE. PART III. ON THE FREQUENT SMOG ALERT IN UBE CITY.

(Toppatsuteki taiki oten to sono geninteki kosatsu. Sono 3. Ube-shi no chuho hiroatsu ni tsuite). Text in Japanese. Yamaguchi Idoi Sangyo Igaku Kenkyusho Nenpo (Ann. Report Res. Inst. Ind. Med., Yamaguchi Med. School), no. 16:228-233, 1969. Yoshikatsu Nose, and Kitsuko Nose. Identifiers: *Alerts, *Industrial emission sources, *Meteorology, *Sulfur dioxide, Control agencies, Enforcement procedures, Meetings, Personnel, Citizens groups, Standards, Japan, Industrial areas, Measurement methods, Continuous monitoring, Winds, Humidity, Temperature (atmospheric), Stability (atmospheric).

From June to Sept. 1969 there were eight smog warnings in Ube. Since it was not clear whether

these sudden increases in sulfur dioxide were due to meteorological anomaly or to mistakes in industrial operations, an investigation was conducted. Based on the data obtained at automatic continuous monitoring stations and meteorological data such as wind directions, wind speed, temperature, and humidity, the graphical analyses showed that the pollutants originated from the western industrial complex of Ube. During all eight smog alerts, the time variation of sulfur dioxide concentration, wind speed, and temperature all had parallel relationships as against the movement of humidity, indicating that there was a mistake in the industrial operations rather than a meteorological accident. All eight warnings were issued on afternoons when the temperature was high, humidity was low and there was wind. By discussing the matter at the local public nuisance control committee, the industries voluntarily made improvements and sudden smog warnings have not been issued since then. Some recommendations are presented concerning the improvement of the environmental standards, measurement methods, personnel requirements, and enforcement. APTIC-23150

ON THE UNEXPECTED AIR POLLUTION AND THE CONSIDERATION OF THE CAUSE. PART I. EPIDEMIOLOGICAL RESEARCH ON THE IRRITATING GASES IN NANYO-CHO.

(Toppatsuteki taiki oten to sono geninteki kosatsu. Sono 1. Nanyo-cho ni okeru shigekisei gasu no ekigakuteki tsuikyū). Text in Japanese. Yamaguchi Idoi Sangyo Igaku Kenkyusho Nenpo (Ann. Report Res. Inst. Ind. Med., Yamaguchi Med. School), no. 16:221-224, 1969. 1 ref. Yoshikatsu Nose, and Sekio Ueno. Identifiers: *Questionnaires, *Odors, *Industrial emission sources, *Odorimetry, Control agencies, Enforcement procedures, Meetings, Complaints, Japan, Industrial areas, Monitoring, Meteorology, Acetic acid, Aldehydes, Ammonia, Halogen gases, Hydrocarbons, Ethylene.

Residents living close to the coastal petrochemical industry complex in Nanyo, Yamaguchi, have been complaining of occasional severe eye irritations. The residents were asked to fill out questionnaires and six persons were requested to be confidential monitors. The analysis of complaint frequencies, the geographical distributions of complaints, and wind speed and direction led to the conclusion that the eastern industrial complex could be excluded. The compilation of the types of physical perceptions, (eye irritation, sweet-sour smell) and the geographical distribution of the frequency of complaints indicated that the obnoxious gas originated periodically from the western complex. Contrary to the claim by the industrial representatives that the pollution is a secondary or indirect result of photochemical effect in the atmosphere, the data revealed that the emissions were directly from the factories. The reports from the monitors further confirmed that the odors probably consist of halogens, aldehydes, halogen compounds of hydrocarbons, acetic acid, or ethylene. The responsible factories subsequently voluntarily eliminated the emissions. APTIC-23152

AN ADDRESS ON POLLUTION.

For primary bibliographic entry see Field 13. APTIC-23155

AIR POLLUTION CONTROL HITS RED TAPE.

Environ. Sci. Technol., 4(10):802-804, Oct. 1970. Personal Author Not Recorded. Identifiers: *Administration, *State governments, *Clean air act, Control programs, Air quality criteria, Regional governments, New Jersey, New York state, Pennsylvania, Texas.

Tortuous procedures in the 1967 Air Quality Act have impeded state officials with advanced programs and time schedules. Considering the number of regions in some states, plus the number of docu-

ments—now for five pollutants: sulfur dioxide, particulate matter, carbon monoxide, hydrocarbons, and oxidants—the procedures for compliance require considerable manpower in possibly unproductive use of valuable time. Alexander Rihm, Jr., Assistant Commissioner for Air Resources in New York State's Department of Environmental Conservation, objects to the federal guidelines as they put emphasis on modeling. Designation of regions is another complaint, as well as with the administration of the law. Sussman of Pennsylvania also objects to the regional approach, diffusion modeling, and the fact that the '67 act brought Pennsylvania's regulatory development program to a screeching halt. Perhaps the most frustrating exercise of state control officials is the actual translation of criteria into control strategy, says Munroe of New Jersey. McKee of Texas wonders if the paperwork created by the Air Quality Act of '67 may not create a greater solid waste disposal problem than the air pollution problem we are trying to solve. APTIC-23157

A PRELIMINARY SURVEY OF THE INDUSTRIAL HYGIENE PROBLEM IN THE UNITED STATES.

For primary bibliographic entry see Field 07. APTIC-23234

THE AIR IN APPALACHIA: AIR POLLUTION AND THE LAW.

Appalachia, 3(9):11-19, June-July 1970.

Robert Broughton.

Identifiers: *Abatement, *Legislation, Administration, Control agencies, Enforcement procedures, Federal governments, Legal aspects, Hearings, Litigation, Standards, Air quality standards, Emission standards, Taxation.

Federal action dealing with air pollution is incorporated in the Clean Air Act of 1963 (amended in 1965-67), the Air Quality Act of 1967, and the National Environmental Policy Act of 1969; the provisions of these and the functions of the National Air Pollution Control Administration are outlined; these functions include designation of Air Quality Control Regions, publication of air quality criteria and control techniques for each major type of pollutant, and review of standards and plans prepared by the states. The effectiveness of this legislation is assessed. The distinction between air quality standards and emissions standards, and the need for national standards of both types are discussed. Air pollution control bodies should have four components: an administrative structure, set of rules, procedures for changing rules, and a system of rewards and penalties. The various forms these components may take are described. Incentives to encourage abatement can include low-interest loans, subsidies, and tax relief, while deterrents may be enacted as criminal sanctions (fines), injunctive relief, and civil penalties. Highly-developed monitoring techniques for emissions and ambient air are essential to any system of enforcement. Citizen participation through public hearings, citizen lawsuit, and appeal of administrative decisions is discussed. A table giving the status of Air Quality Control Regions affecting Appalachia as of May 15, 1970 is included. APTIC-23242

AIR POLLUTION ABATEMENT BY FEDERAL FACILITIES.

91st Congress (Senate), 2nd Session Rept. 91-77, 35p., Jan. 1970. Personal Author Not Recorded.

Identifiers: *Abatement, *Federal governments, Control programs, Costs, Clean air act, United states.

The efforts of Federal departments and agencies to abate and control air pollution at Federal facilities in the 50 States, the District of Columbia, Puerto Rico, Guam, and the Virgin Islands are

reviewed, based on data submitted to the Bureau of the Budget by the various departments and agencies in accordance with Executive Order 11282 (which, on February 5, 1970, was superseded by Executive Order 11507). The data submitted by the various departments and agencies indicate that, in the year ending April 1, 1969, there were 528 remedial actions taken at 425 installations located in 46 States, the District of Columbia, Guam, and Puerto Rico. The details are reported in Appendix A and Appendix B. These actions were in addition to abatement projects undertaken in previous years and listed in previous editions of this annual report to the Congress. A review of data submitted by the various departments and agencies since the issuance of Executive Order 11282 indicates that expenditures of approximately \$36 million are associated with air pollution abatement work completed or still underway. Progress in the National Capital area has been particularly notable. While there is only one Federal facility now operating under an exemption from the regulations issued by the Secretary of Health, Education, and Welfare, this does not mean that all other Federal facilities have completed their work on abatement and control of air pollution. Abatement projects are undertaken in accordance with a five-year plan developed under Executive Order 11282. Thus, there are many facilities where abatement projects have yet to be undertaken. Among the problems that have not been attacked effectively, two are particularly significant: emissions from large Army ammunition plants, and smoke from a few large and many small fire-fighting training schools. Though projects to deal with problems such as these at several Federal installations had been scheduled to begin by now, the funds needed for many of them have not been provided.

APTIC-23274

FRAMEWORK FOR A COHERENT NATIONAL POLICY ON URBAN LAND. (FINAL REPORT). Rept. 3, 13pp., Sept. 1969. 4 refs. CFSTI: PB 190842

Personal Author Not Recorded.

Identifiers: *Proposals, *Planning and zoning, *Urban areas, Enforcement procedures, Federal governments, Area emission allocations.

A study was performed to establish a framework to facilitate the analysis and formulation of a coherent national policy for urban development, insofar as that development is related to the public control of urban land. The framework was created by identifying the broad overall policy in relation to urban development: to increase 'urban capacity'; to analyze the overall policy into three component lines of policy—improve the quality of existing cities, increase the quantitative capacity of existing cities, and create new towns; and to analyze each of those lines into particular sub-policies. The framework was then used to structure an inventory of current federal policies and programs which bear on the use of urban land in relation to the objective of increasing urban capacity. By comparing the inventory with the sub-policy objectives indicated in the framework, certain gaps in policy were identified. Specific policies are proposed to fill these gaps. (1) As a means of providing additional encouragement to private developers of new towns, it is proposed that the federal government might (a) create a Bank for New Town Development and (b) consider offering sites on the Public Domain to developers. (3) As a means of segregating and controlling activities that emit inter-state pollutants, it is proposed that the federal government might establish Federal Pollution Zones in which such activities would be specifically licensed. (4) As an agency to coordinate federal policy in this field, it is proposed that a Federal Authority for Urban Land might be created.

APTIC-23275

REPORT FOR CONSULTATION ON THE MERRIMACK VALLEY-SOUTHERN NEW

HAMPSHIRE INTERSTATE AIR QUALITY CONTROL REGION (MASSACHUSETTS AND NEW HAMPSHIRE). 92p., June 1970. 26 refs.

Personal Author Not Recorded.

Identifiers: *Air quality control regions, *Massachusetts, *New Hampshire, Area surveys, Regional governments, Area emission allocations, Socio-economic factors, Urban areas, Valleys, Particulates, Steam plants, Incineration, Open burning, Solid waste disposal, Landfills, Vehicles, Emission inventories, Point sources, Wind rose, Hydrocarbons, Carbon monoxide, Nitrogen oxides, Sulfur oxides.

An air quality control region should encompass most pollution sources as well as most people and property affected by the sources; it should include those areas where industrial and residential growth may create significant future problems; and it should be consistent with unified and cooperative administration of the region's air resources. Geography and past growth, the present population and economic activity, and the prospective population and economic growth are evaluated for the proposed region of the Merrimack Valley-Southern New Hampshire area. The cities and towns within the Region which have long been linked by geography, a common pattern of manufacturing activity, and an integrating transportation system are likely to increase their economic interdependence. An emission inventory and air quality analysis are considered for the area, as well as the regional governmental organization. The Massachusetts portion of the proposed Region is identical in composition with the State's proposed Merrimack Valley Air Pollution Control District, while the New Hampshire portion of the proposed Region consists of the New Hampshire State planning districts 7, 12, 13, 14, 15, 16, and 17.

APTIC-23289

AIR POLLUTION IN CAROLINE COUNTY MARYLAND.

Maryland State Department of Health, Baltimore, Div. of Air Quality Control and Caroline County Dept. of Health, Denton, Md., 19p., Jan. 1970. 15 refs.

H. L. Alkire.

Identifiers: *Regulations, *Caroline county, *Sources, Area surveys, County governments, State governments, Maryland, Combustion products, Odors, Particulates, Smokes, Fuel oils, Industrial emission sources, Food and feed operations, Incineration, Open burning, Dumps, Landfills, Automotive emission control, Winds, Sulfur compounds.

The present survey emanated from the need of the Division of Air Quality Control of the Maryland State Department of Health to have a county by county statement, based on available information, on the status of air contamination in the various areas. The survey was made in accordance with authority granted under the Maryland Air Quality Control Act (Article 43, Annotated Code of Maryland, 1957 Edition and Supplement). Regulations have been adopted by the county governing the control and prohibition of open fires, the control and prohibition of visible emissions, and the control and prohibition of particulate emissions from fuel combustion. Amendments to these regulations which became effective on January 29, 1969 govern the sulfur content of all heating oils and of oil used in very large installations after July 1, 1970; prohibit removing air pollution control devices from motor vehicles as well as requiring that the devices be kept in operating condition; provide for the control of the discharge of gases, vapors or odors; and, in addition, are concerned with control of visible and particulate emissions from industrial and incineration operations. Plants at Denton and Ridgely fortunately have been located so that those communities are upwind of the prevailing west and northwest winds. Two poultry processing plants create the types of odors usually associated therewith but they are ruraly located. There are no plants for the rendering of

inedible portions of chickens in the county. Five dumps are used for the disposition of about 8500 tons of refuse annually. The burning of material is on an irregular schedule and is somewhat controlled. However, material is not covered frequently and the dumps are odorous. Investigations are under way with the aim of substituting sanitary landfills for the dumps. The disposal of home-generated trash and leaves in smaller communities and by burning is a general practice. The processing of clams near Ridgely produces some odors which escape into the town and may lead to objectionable conditions. However, some residents of the area reported that they were not of an objectionable nature. Smoke has been emanating periodically from the stack of milk plant in Greensboro, but this is resulting from improper operation of new equipment which was installed to correct previously unsatisfactory smoke emissions.

APTIC-23313

AIR POLLUTION IN TALBOT COUNTY MARYLAND.

Maryland State Department of Health, Baltimore, Div. of Air Quality Control and Talbot County Dept. of Health, Easton, Md., 19p., Jan. 1970. 14 refs.

H. L. Alkire.

Identifiers: *Regulations, *Talbot county, *Sources, Area surveys, County governments, State governments, Maryland, Combustion products, Odors, Particulates, Coal, Fuel oils, Industrial emission sources, Food and feed operations, Incineration, Open burning, Dumps, Landfills, Automotive emission control, Sulfur compounds.

The present survey emanated from the need of the Division of Air Quality Control of the Maryland State Department of Health to have a county by county statement, based on available information, on the status of air contamination in the various areas. The survey was made in accordance with authority for the Secretary of Health and Mental Hygiene to adopt regulations governing the control of air pollution in the State. Regulations applicable in Talbot County have been adopted governing the control and prohibition of open fires, the control and prohibition of visible emissions, and the control and prohibition of particulate emissions from fuel combustion. Amendments to these regulations which became effective on January 29, 1969 govern the sulfur content of all heating oils and of coal used in very large installations after July 1, 1970; prohibit removing air pollution control devices from motor vehicles as well as requiring that the devices be kept in operating condition; provide for the control of the discharge of gases, vapors or odors; and, in addition, are concerned with control of visible and particulate emissions from industrial and incineration operations. Most sources of air pollution in Talbot County, although relatively small and few in number, are clustered in the Easton area. Pollution generally is associated with the processing of vegetables, the shelling and drying of corn which create 'beeswing' chaff, and the processing of seafood. Other than in the Easton area, these are widely scattered and objectionable levels of pollution are localized. Almost all refuse material is disposed of in landfills. However, burning sometimes occurs at the Tighman-Sherwood dump and occasionally at the St. Michaels dump.

APTIC-23314

PROGRESS IN STATE AND LOCAL AIR POLLUTION CONTROL UNDER THE CLEAN AIR ACT.

Am. Ind. Hyg. Assoc. J., 31 (4):506-509, July-Aug. 1970. (Presented at the American Industrial Hygiene Conference, Denver, Colo., May 14 1969.)

Charles D. Yaffe.

Identifiers: *Local governments, *State governments, *Clean air act, Budgets, Grants, Control agencies, Enforcement procedures, Federal governments, Regional governments, Regulations.

Attention to the problems of air pollution has been stimulated by Federal legislation beginning in 1955 when research, training, and technical assistance activities were authorized. The Clean Air Act, passed in December 1963, added financial support to help create or strengthen state, regional, and local air pollution control programs, and also mechanisms for Federal participation in pollution abatement actions under certain circumstances. The recent rapid increase in state control laws is undoubtedly due in large part to these aspects of the Clean Air Act of 1963 and to some of its amendments of 1965, 1966, and 1967. At the beginning of 1967, authority for state control of air pollution was lacking in 25 states. At the beginning of the 1969 session, only four state legislatures had not yet passed control laws. Most, if not all of these, will probably take such action this year. In addition, many of the earlier laws were strengthened during the 1967 and 1968 sessions, or will be this year. An expressed objective of the Clean Air Act was to stimulate a greater non-Federal effort. A measure of the effectiveness of the grant incentives can be seen by comparing the \$9.6 million of non-Federal expenditures in 1969 with \$1.1 million in 1961 for support of state air pollution control programs and, for local and regional control programs, in the increase of non-Federal funds from \$8.2 million in 1961 to \$17.2 million in 1969. The number of agency budgets exceeding \$100,000 increased during that period from 13 to 22, with annual budgets of over \$250,000 increasing from five to ten. One indication of response to public demand for air pollution control has been legislative action to increase maximum penalties for violations. A number of state laws now authorize fines of at least four instances in which courts have imposed fines of \$10,000 or more. In addition, the injunctive power has been invoked relative to some sources of pollution.

APTIC-23327

13. SOCIAL ASPECTS

AN AIR POLLUTION PUBLIC OPINION SURVEY FOR THE CITY OF MORGANTOWN, WEST VIRGINIA.

West Virginia Univ., Morgantown, Thesis (M.S.), 1966, 46p. 10 refs.

Robert Edwin Lawyer.

Identifiers: *Opinion surveys, *Morgantown (west virginia), Humans, West virginia, Questionnaires.

The effect of memory retention of previous air pollution levels on the present attitudes of heads of households in Morgantown, West Virginia, was studied. Results regarding memory retention indicate a definite difference in present attitudes between those having a previous memory of relatively high air pollution levels who are now living in Morgantown and those with a memory of relatively low levels. A control point is established in that all memory retention is referenced to ambient air levels now in Morgantown. The outline of the questionnaire is given, as well as methods of interview, data handling analysis, and general procedures of the study. (Author abstract modified)

APTIC-21897

OPINIONS CONCERNING THE ENVIRONMENTAL STANDARD FOR SULFUR DIOXIDE RECOMMENDED IN THE HEARING BY THE ENVIRONMENTAL HEALTH COMMISSION.

For primary bibliographic entry see Field 11.

APTIC-22135

AIR POLLUTION TASK FORCE STUDY ATTACKS INDUSTRY, GOVERNMENT.

Petro/Chem Engr., 42 (8):10-12, 14-15, Aug. 1970. Bill Jaynes.

Identifiers: *Public information, Plans and programs, Federal governments, Legislation, Social attitudes, Fuel oils, Gasolines, Primary metallurgical processing, Automobiles, Desulfurization of fuels.

Excerpts from an air pollution study which is critical of both government and industry are presented. Corporations are accused of collusive associations to prevent citizens from finding facts, but ways in which corporations can become more responsive and more responsible are discussed. Industrial polluters and their attitudes are described. Problems associated with lead-free gasoline are considered, and the automobile manufacturers' responses to various control mechanisms are documented. Oil refineries are indirectly responsible for the high national level of sulfur dioxide emissions, due to their resistance to producing low-sulfur fuel. Pollution measurement technology is archaic, having seen no new developments in the past 15 years. The Federal government, in terms of volume of emissions, is a major polluter. Ineffective legislation is criticized in several major cities, and on a national level. Solutions to the environmental problem are suggested, including the implementation of a national policy to fight pollution, and a major revision in corporate structures. Recent decisions by the President of oil import quotas are deplored.

APTIC-22341

PROGRESS OF 'KOGAI' CONTROL AND PUBLIC OPINION (PART IV).

For primary bibliographic entry see Field 12.

APTIC-22349

THE POLLUTION ALTERNATIVES - ENVIRONMENTAL CONTROL OR A LOST CIVILIZATION.

Can. Mining Met. Bull. (Montreal), 63 (701):974-978, Sept. 1970.

J. P. Nowlan.

Identifiers: *Socio-economic factors, *Solid waste disposal, Research programs, Public information, Canada, Electric power production, Mining.

The rate of growth and hence the concentration of industry has been accompanied by increasing concentrations of population and by a tremendous upsurge in the output of thermal energy. One of the reasons why this surge in pollution was largely unforeseen is the dominance of specialists in our complex economy without regard to consequences on the total environment. A fundamental problem is ignorance - we do not know the optimum ratio between use and conservation to maintain or enhance the desirable features of our environment. Most of our pollution problems are due to concentrations of humans and of industry in certain areas to a point where the natural forces of waste control are no longer effective. Overcrowding of any species leads to degeneration of individuals and behavior aberrations. Research should be conducted into plasma conversion of garbage into its atomic elements, and growth of oxygen-producing algae should be encouraged to utilize these plants at maturity for their protein content. The energy balance in lakes needs to be studied much more intensively than has been done in the past. Tidal power is mentioned as an energy alternative to combustion and atomic power. Pollution and the mining environment are discussed, and the need for more publications as the one recently published outlining development and rehabilitation methods for open-pit mines is urged.

APTIC-22636

THE PREVENTION OF ATMOSPHERIC POLLUTION IN PLANNED SITES.

(La prevention de la pollution atmospherique dans l'aménagement concerté). Text in French. Pollut. Atmos. (Paris), 12 (46):94-106, April-June 1970. 1 ref.

M. J. Mazodier.

Identifiers: *Planning and zoning, *Urban areas, Area surveys, France, Settling particles, Suspended particulates, Industrial emission sources, Air quality measurements, Control methods, Dispersion, Sulfur dioxide.

A method to consider atmospheric pollution in planning for the development of an area is presented. The environmental factors that have an influence on the dispersion and the transformation of pollutants are considered. Sources of pollution are mentioned, and the final result of pollution in the environment is described. Index pollutants used are sulfur dioxide and suspended and settling particulates. Based on all the relevant factors, selection of zones most suitable for the planned development is discussed. As an example of this method, actual studies conducted on areas to be developed for industrial and residential uses are given, as well as the general preventative measures that were recommended. (Author abstract modified)

APTIC-22665

A NEW POLITICAL APPROACH TO CONTROL PUBLIC NUISANCE.

For primary bibliographic entry see Field 12.

APTIC-23145

AN ENTERPRISE AND PUBLIC NUISANCE.

(Kigyo to Kogai). Text in Japanese. Yamaguchi Idai Sangyo Igaku Kenkyusho Nenpo (Ann. Report Res. Inst. Ind. Med., Yamaguchi Med. School), no. 16:234-240, 1969. 2 refs.

Yoshikatsu Nose.

Identifiers: *Abatement, *Control agencies, *City governments, *Health statistics, Control programs, Meetings, Public affairs, Citizens groups, Epidemiology, Mortality, Japan, Industrial areas, Combustion products, Fuel oils, Industrial emission sources, Meteorology.

The types and causes of industrial nuisances and failures in the public and private sectors of society to strive for nuisance control are mentioned. The main point of the discussion is the Ube System by which air pollution has been successfully countered in the industrial cities in Yamaguchi Prefecture. The system as conducted consisted of community diagnosis, including inventorying basic data on pollution sources, meteorological conditions, and atmospheric pollution and then relating them all together. Also the relationships between the health statistics of the residents and air pollution were carefully studied. Treatment planning consisted of planning to counter falling ashes, then preventing dusts from escaping into the atmosphere and finally countering air pollution in general. The key to successful completion of this phase was the step-wise execution of realistic and feasible measures, with the aid of the pollution control committee consisting of city council members and many industrial representatives. The actual practice of pollution control owed very much to the understanding and the determination of the mayor of Ube and the city councilmen as well as the strong interest of the local industries. Of course the positive motivation of the citizens themselves cannot be overlooked. Some medical trends and air pollution trends in the cities since 1964 are tabulated.

APTIC-23147

AN ADDRESS ON POLLUTION.

Philadelphia Med., 66 (18):779-783, Sept. 1970.

(Presented at the Delaware Valley Citizen's Council for Clean Air, Annual Meeting, Philadelphia, Pa., April 25, 1970.)

Arlen Spector.

Identifiers: *Socio-economic factors, Enforcement procedures, Legal aspects, Automotive emissions, Solid waste disposal.

In the United States there is dumped annually 350 billion tons of garbage and sewage, 48 billion metal cans, one billion tons of mining wastes, 20 million tons of paper, and 7 million worn-out automobiles. With every breath, we inhale air containing some 70,000 particles of dust, and added to this a whole legion of grisly gases, fumes, acids, ammonia, metallic oxides, and the by-products of various industries. Automobile emissions are mentioned,

and the disturbing thought that afterburners and catalytic mufflers which may reduce carbon monoxide emissions may also increase nitrogen oxides. In the past four years, a total of only \$3120 in fines were levied against the 15 top polluters in Philadelphia, and the figure of \$50 per firm per year makes a mockery of the term enforcement. APTIC-23155

A COURSE ON THE PHYSICS OF URBAN AND ENVIRONMENTAL PROBLEMS.

Am. J. Phys., 38 (10):1244-1247, Oct. 1970. 11 refs. Edwin H. Marston.

Identifiers: *Education, Universities, Urban areas, Electric power production, Water pollution, Transportation, Internal combustion engines.

A course taught at Queens College entitled the Physics of Urban and Environmental Problems is described. Its main feature is a physical and quantitative analysis of such problems as ground transportation, the internal combustion engine, electric energy production, air pollution, thermal pollution of water, nuclear radiation hazards, and landscape destruction by hydroelectric projects. The material is presented through case studies, with each case consisting of the political, legal, social, or economic background to the problem, the relevant physics, the necessary data, and a number of mainly quantitative questions. In the transportation section, the physics of motion is used to estimate the passenger carrying capacities of highway lanes, railroad tracks, airport runways, sidewalks, and passenger-carrying conveyor belts. The next part of the course covers work, power, potential and kinetic energy, conservation of energy, Newton's laws, electrical energy, heat, temperature, the second law of thermodynamics, and chemical and nuclear energy. Case studies include the amount of air pollution produced, the horsepower needed and the fossil fuel consumed in transporting passengers by electric powered train and by automobile, the quantity of heat that will be dumped into Cayuga Lake by New York State Gas and Electric's 830-mw plant, and other situations. The final section surveys the estimated amounts of food, energy, minerals, and water available to us. The first hourly examination asked the students to design a ground transportation system for the then still alive Everglades jetport. Evaluation of the course and text and reference material are also discussed. APTIC-23333

THE CONVERGENCE OF ENVIRONMENTAL DISRUPTION.

Science, 170 (3953):37-42, Oct. 2, 1970. 12 refs. (Presented at the International Social Science Council's Standing Committee on Environmental Disruption, International Symposium on Environmental Disruption in the Modern World, Tokyo, March 1970.) Marshall I. Goldman.

Identifiers: *Socio-economic factors, *Ussr, Stack gases, Paper manufacturing, Water pollution.

An attempt is made to ascertain why it is that pollution exists in a state-owned, centrally planned economy like that of the Soviet Union. Perhaps the best known example of the misuse of water resources in the USSR has been what happened to Lake Baikal, in which there were over 1200 species of living organisms, including freshwater seals and 700 other organisms that were found in few or no other places in the world. In 1966, first one then another paper and pulp mill appeared on Lake Baikal's shores, and a few months after their effluent had been discharged into the lake, animal and plant life had decreased by one-third to one-half in the zone where the sewage was being discharged. Of all the factories that emit harmful wastes through their stacks, only 14% were reported in 1968 to have fully equipped air-cleaning devices. Leningrad has 40% fewer clear days than the nearby town of Pavlovsk. Excessive construction has loosened the soil and accelerated the

process of erosion, while much of the Black Sea area has been simply hauled away by contractors. As in the United States, the Russians have not been able to create clear lines of authority and responsibility for enforcing pollution-control regulations. They too have been unable to adjust their accounting system so that each enterprise pays not only its direct costs of production for labor, raw materials, and equipment, but also its social costs of production arising from such by-products as dirty air and water. State officials in the Soviet Union are judged almost entirely by how much they are able to increase their region's economic growth, and as industrialization has come relatively recently to the USSR, the Russians tend to emphasize an increase in production. Until July 1967, all raw materials in the ground were treated by the Russians as free goods, while economic growth has been even more unbalanced than in the U. S. However, the Russians have the power to prevent the production of various products, and they have not permitted as much emphasis on consumer goods. While not all Russian laws are observed, they do have an effective law enforcement system which they have periodically brought to bear in the past. APTIC-23344

14. GENERAL AND MISCELLANEOUS

THE WORLD TREND OF PUBLIC NUISANCE CONTROL TECHNIQUES.

(Sekai no kogainboshi gijutsu no doko). Text in Japanese. Hosho Kenkyu (J. Compensation Res.), 7 (71):1-7, March 1969. T. Oshima.

Identifiers: *Abatement, *Trends, Air quality criteria, Governments, International, Japan, Water pollution, Sulfur dioxide.

General comments are made on air and water pollution and their control measures in various countries. Water quality criteria are introduced in terms of pH, BOD, oil component, and suspended substance. In Europe, the lack of substantial data and the shortage of low-sulfur petroleum seem to stand in the way of definite air quality criteria, and in the United States, different states have different criteria, with New York having the most stringent standards, such as in sulfur dioxide emissions. In general, the criteria are still intermediate. The way the governments of various countries approach the public nuisance control programs are presented, especially for the U. S. and West Germany, where the approaches are quite different. In view of the control measures to be established in Japan, the conclusion is that the control methods should be approached scientifically, patiently, and in a mutually conciliatory fashion, as is evident in the U. S. and in the European industrialized nations. APTIC-22131

PROTECTION OF AIR IN BUDAPEST.

(Budapest levegojenek). Text in Hungarian. Energia Atomtech. (Budapest), 23 (5):208-210, 1970.

Gyorgy Sardi.

Identifiers: *Abatement, *Budapest, *Fuels, Costs, City governments, Regulations, Europe, Urban areas, Fly ash, Smokes, Coal, Fuel gases, Fuel oils, Domestic heating, Vehicles, Sulfur dioxide.

Within the 525 sq km area of the City of Budapest, the damage to property, caused by air pollution, is estimated at 700 times 10 to the 6th power ft/year (official exchange rate: 11.40 ft equals \$1; tourist rate: 30 Ft equals \$12). Considering the health-hazard (which can not be described in monetary terms) as well, the fight against air pollution in Budapest received considerable funding priority. The two main pollutants in Budapest are sulfur and fly ash. Elements of the long-range solution includes district heating of apartment houses, with the elimination of the use of coal and briquette by

hydrocarbons (city gas, natural gas, oil); the Budapest City Council, in 1963, prohibited the installation of new, coal burning heating equipment (except for one-family houses); and so-called 'protected zones' were declared within the city, where the use of high sulfur fuel (over 1%) has to be phased out within 4 years. The consumer has the right to select a new energy-carrier (district heating or gas); the cost of transition has to be born by the consumer. Discounts had been obtained to decrease the costs to the population. The 'coal free areas' (presently one-and-a-half districts) will be increased in future years. Smoke emission was regulated by a city ordinance of 1962; since 1969, the responsible industrial executives, are subject to personal fines for smoke emission. There is a Combustion Technology Group of the City to render technical assistance. A simple, low cost fly ash separator prototype was developed by the City and tested in 1970. Individual 'pollution norms' were set up for the large factories in Budapest. Air pollution monitoring stations were established. The fight against motor vehicle emission is in the research and development stage at the present. APTIC-22416

REVIEW OF WORKS ON COUNTERMEASURES TO AIR POLLUTION.

(Kogai-taiki oosen taisaku no doko). Text in Japanese. Nenryo Kyokaiishi (J. Fuel Soc. Japan, Tokyo), 49 (518):495-500, June 1970. 100 refs. Personal Author Not Recorded.

Identifiers: *Standards, *Japan, *Measurement methods, *Control methods, Maximum allowable concentration, Automotive emissions, Engine exhausts, Combustion gases, Fumes, Smog, Smokes, Pilot plants, Stacks, Sampling methods, Desulfurization of fuels, SO₂ removal (combustion products), Diffusion, Tracers, Phenols, Pyridines, Mercaptans, Carbon monoxide, Sulfur dioxide, X-rays.

Recent trends and works concerning the control measures for air pollution are reviewed. Diffusion and measurement of pollution, desulfurization of heavy oil, cleaning exhaust fumes and automotive contamination of the atmosphere are the principal subjects. The most significant progress in the measurement of the diffusion of pollutants is the use of laser radar to investigate directly the smoke and smog substances. Although pyridine, phenol, mercaptan and carbon monoxide were added to the list of harmful gases, no new measurement methods were registered in JIS. The damages due to sulfur dioxide are increasing, and many policy decisions are being made to counter the problem. The 'Environmental Standard for Sulfur Dioxide' is one of them. The investigation of active manganese oxide and active carbon methods of exhaust fume desulfurization conducted by the Ministry of International Trade and Industry in a pilot plant operation are being continued in order to gain more information. As for automotive pollution, the allowable concentration of carbon monoxide in new car exhaust, as tested in the four-mode driving condition, was lowered from 3% to 2.5%. APTIC-22519

OUTLINE OF AIR POLLUTION PROBLEMS IN JAPAN.

In: Introduction to Environmental Problems. Ministry of Health and Welfare, Tokyo (Japan), 32p., Feb. 1970. (Presented at the WHO Inter-Regional Seminar on Air Pollution Control, Moscow, USSR, Sept. 1967.)

Keiji Furuichi, and Masahiro Fujiwara.

Identifiers: *Abatement, *Japan, Air quality measurement programs, Legislation, Control agencies, Area emission allocations, Socio-economic factors, Emission standards, Children, Bronchitis, Urban areas, Engine exhausts, Stack gases, Dusts, Domestic heating, Automobiles, Dust fall, Diffusion, Sulfur dioxide.

The air pollution problem in Japan is a result of dense population and industrial dependence. Dust fall in main urban areas reaches 15 tons/sq

km/month. The sulfur dioxide and particle monitoring system in Japan is described. The Air Pollution Control Administration has established control regions, emission standards, and application permit procedures. Control of automobile exhausts and domestic heating are discussed. Funding and prevention mechanisms are described. Recent legislation designed to control pollution is mentioned. A series of surveys, including atmospheric diffusion by tracers and the incidence of bronchitis in children in polluted areas are reviewed. A comprehensive approach to pollution abatement should include social and economic considerations.
APTIC-22648

UP-TO-DATE SANITARY INVESTIGATIONS ON AIR.

(Korzeru levegoegeszsegugyi vizsgalatok). Text in Hungarian. Energiátomtech. (Budapest), 23 (5):211-214, 1970.
Jozsef Morik.
Identifiers: *Hungary, *Combustion products, Plant damage, Carcinogens, Europe, Urban areas, Smog, Primary metallurgical processing, Domestic heating, Automobiles, Dispersion, Carbon monoxide.

Air-sanitary investigations conducted in Hungary since the 1870's are described; some results (e.g., the correlation between air pollution and the number of foggy days in Budapest) were internationally acclaimed as 'firsts'. Nevertheless, only after the Soviet Army liberated Hungary could organized air-sanitary activity and parallel effective defense against air pollution develop. The work was done mainly in different institutions of health (e.g., university departments of public health, National Institute of Health, etc.). The last 10-15 years brought the following results: identification of the main sources of pollution, the most exposed urban areas; disclosure of some of the laws of air pollution dynamics, pollutant spread and accumulation; and the impact of air pollution on vegetation. The first Hungarian norms on air hygiene were formalized. Experimental work on carbon monoxide, carcinogens, the vertical spread of air pollution and methodology was performed. The prime culprit in air pollution in Hungary is industrial combustion, and household heating. Automobiles have some role. Other industrial pollutants of secondary importance are steel and aluminum mills. Pollution in Budapest is the severest in the country; measured values are usually above accepted norms. Smog became a regular occurrence in Budapest in the winter and spring. The pollutants present in city air are more numerous and more toxic than the sum of the emissions would indicate: secondary reactions due to sunshine are to blame. Four lines of activities are proposed: 1. environment characterization; 2. effects on the population; 3. setting up of norms; 4. and checking the effectiveness of anti-pollution measures.
APTIC-22840

SUMMARY OF CONFERENCE AND CONCLUSIONS AND RECOMMENDATIONS ON INTERSTATE AIR POLLUTION. NEW YORK-NEW JERSEY METROPOLITAN AREA.

Preprint, 34p., Jan. 1967. (Presented at the Interstate Air Pollution Abatement Conference, New York-New Jersey Metropolitan Area, Jan. 3-13, 1967.)

Personal Author Not Recorded.

Identifiers: *Abatement, *New Jersey, *New York state, Costs, Economic losses, Governments, Clean air act, Air quality standards, Plant damage, Health impairment, Materials deterioration, Electric power production, Domestic heating, Visibility, Transport, Carbon monoxide, Sulfur dioxide.

A summary of conference findings on interstate air pollution subject to abatement under the Clean Air Act in the New York-New Jersey metropolitan area is presented. Transport of pollution from one state to the other is demonstrated in both directions. Reduced visibility due to air pollution

occurs for motorists and pilots. Plant damage and material deterioration is widespread in the area. Economic losses and costs of obtaining various air quality levels are determined. Health effects of air pollution are discussed. The adequacy of measures taken toward abatement is discussed in terms of air quality standards and other types of legislation. Recommendations regarding interstate control, control of sulfur dioxide emissions from power generating plants, space heating, and industrial processes, control of carbon monoxide emissions, and control of industrial emissions are presented.
APTIC-22910

INDUSTRIAL APPLICATIONS OF WIND TUNNEL INVESTIGATIONS.

Advisory Group for Aeronautical Research and Development, Paris (France), Rept. 314, 14p., Oct. 1960. 9 refs. (Presented at the Fluid Dynamics Panel Meeting on 'The Industrial Uses of Wind Tunnels', Istanbul, Turkey, Oct. 3-8, 1960.)
CFSTI: N62-14505

Frederick K. Boutwell, and R. Clay Porter.
Identifiers: *Wind tunnels, *Stacks, *Plume behavior, Stack gases, Design criteria, Height finding, Testing facilities, Winds, Topographic interactions, Fluid flow.

Some of the differences between aeronautical wind-tunnel testing and industrial applications, where the effect of atmospheric wind on the surrounding terrain is usually the point of interest, are reported. The need to determine the interaction between several buildings or objects, as distinct from the airflow around a single object, makes desirable a longer working section than is usually available in conventional wind-tunnels. Tests on the evaluation of smoke stacks, with particular reference to their design and orientation, are described and results are shown of flow patterns, of the determination of minimum stack height, and of the critical ratio of stack-gas velocity to wind velocity for the smoke plume to clear the surrounding terrain. Pictorial examples of wind-tunnel studies of smoke stacks are included. (Author abstract modified)
APTIC-22922

DETERMINATION OF INDUSTRIAL STACK HEIGHTS.

Phil. Trans. Roy. Soc. London, Ser. A, 265 (1161):205-208, Nov. 13, 1969. 3 refs.
W. Klug.

Identifiers: *Stacks, *Height finding, *Meteorology, Germany, Diffusion, Winds, Clouds.

A method has been developed by which meteorologists can supply air pollution authorities with the information necessary to arrive at a decision on minimum heights of industrial stacks. The method relates time of day and year, surface wind velocity, cloudiness, type of clouds, and source height to values of standard deviations of horizontal and vertical Gaussian concentration distribution in six diffusion categories. The values of the standard deviations in the Gaussian concentration distributions are those obtained by diffusion experiments in the atmosphere. The scheme is objective and can therefore be programmed for a computer. With the scheme it is possible to compute from a synoptic observation, together with the technical source data and an assumed chimney building height, the maximum concentration at the surface and its distance from the source. The meteorologist is also in a position to compute frequency statistics of wind velocities and of diffusion categories. With this information, it is possible to compute frequency density diagrams in a coordinate system of normalized maximum concentrations and their distance from the source. From these diagrams the percentage of maximum concentrations above a given threshold concentration and assumed chimney height can be read off and, if necessary, chimney building height adjusted accordingly.
APTIC-22945

SUMMARY OF CONFERENCE AND CONCLUSIONS AND RECOMMENDATIONS ON INTERSTATE AIR POLLUTION NATIONAL CAPITAL METROPOLITAN AREA.

Preprint, 22p., Dec. 1967. (Presented at the Interstate Air Pollution Abatement Conference, National Capital Metropolitan Area, Wash. D. C., Dec. 11-19, 1967.)

Personal Author Not Recorded.

Identifiers: *Abatement, *Washington d c, Costs, Economic losses, Governments, Clean air act, Fuel standards, Plant damage, Health impairment, Materials deterioration, Urban areas, Fuels, Solid waste disposal, Jet aircraft, Diesel engines, Vehicles, Visibility, Transport, Peroxyacetyl nitrate, Sulfur dioxide, Ozone.

A summary of conference findings is presented on interstate air pollution subject to abatement under the Clean Air Act in the Washington, D. C. area including several counties in Maryland and Virginia. Pollutants discharged into the atmosphere in this area are transported across geographical borders unhindered by topographical disturbances. Medical experts discuss the health hazards associated with air pollution. Aviation representatives indicate the adverse effects of air pollution on airline operations, while jet aircraft emissions contribute to the visible pollution in the area. Damage to vegetation caused by ozone, PAN, and sulfur dioxide occurs throughout the area. Deterioration of materials and examples of economic losses are described, as well as the costs of achieving various air quality levels. The adequacy of measures taken toward abatement in the area are discussed, and various legislation is mentioned. Recommendations made regarding interstate pollution control, fuel combustion at stationary sources, solid waste disposal, control of visible emissions, process emissions, diesel bus emissions, and motor vehicles are given.
APTIC-23071

PERSPECTIVES ON POLLUTED AIR-1978.

Bull. At. Sci., 26 (4):2, 34-41, April 1970.

R. Stephen Berry.

Identifiers: *Sources, *Control methods, Abatement, Costs, Socio-economic factors, Urban areas, Automotive emissions, Combustion products, Smog, Smokes, Coal, Fuel gases, Fuel oils, Industrial emission sources, Electric power production, Solid waste disposal, Transportation, Automobiles, Desulfurization of fuels, Gasification (synthesis), Meteorology.

An overview of the air pollution situation considering social, technological, political, and economic aspects is presented. Sources of pollution are categorized as heat and power generation, industrial processes, waste disposal, and transportation. All show a great potential for increase in the near future that will probably override the effects of currently proposed control methods. Types of metropolitan air pollution are identified as grey pollution and brown pollution. Newer cities not relying heavily on coal are characterized by the brown smog of automotive pollution. Older cities and cities where coal is important in the economy are characterized by a grey, particulate pollution. There is mounting evidence that the former cannot exist in the presence of the latter because of the inhibiting effect of sulfur dioxide on the formation of photochemical smog. It is emphasized that the direction of effort in pollution control has and will continue to be a direct reflection of the ease of identification of specific pollutants. As technology permits the identification of more pollutants in smaller quantities, evaluation of their effects and investigation for their control will proceed apace. Control strategies are evaluated with respect to type, cost, and time. Easiest and cheapest to control are dramatic 'episodes.' This can be accomplished by reducing peak pollution concentrations for a few critical hours or days during adverse weather conditions. Reducing chronic pollution levels is usually both slow and expensive. Short-term, intermediate, and long-term strategies are all recommended, with careful consideration of the effects of the 'cure' preceding its

implementation. Representative is the case of power where the short-term plan would involve conversion to gas or low-sulfur coal and oil. Since all of these are in short supply, an intermediate program of fuel desulfurization and mine-head gasification should be rushed through. Still further in the future would be plant re-siting, power transmission via superconductors, and replacement of existing facilities (40 year life) with non-polluting systems. Opinion is presented on who should bear the costs of these programs. A significant recommendation is for the creation of 'micro-NASAs' to perform crash investigations of the technological problems. The National Laboratories are suggested as the starting point for this effort. Enough major problems of research, development, and engineering in environmental control exist to justify long-term support for such programs.

APTIC-23125

A COMPLEX STUDY OF THE ATMOSPHERIC POLLUTION OF TOWNS WITH HIGHLY DEVELOPED PETROLEUM AND PETROLEUM-CHEMICAL INDUSTRIES.

(O kompleksnom izuchenii zagryazneniya atmosfery vozdukha v gorodakh s razvityem nefyanoy i neftekhimicheskoy promyshlennosti'yu). Text in Russian. *Gigiena i Sanit.*, no. 5:101-103, 1970. 3 refs.

A. I. Kopanov.

Identifiers: *Control programs, *Chemical processing, *Petroleum production, Abatement, USSR, Industrial areas.

Parallel studies of air pollution both at petroleum refineries and chemical plants, and in nearly populated areas confirmed the importance of a comprehensive approach as necessary for establishment of specific and effective recommendations for pollution control. Preliminary findings for the cities of Ufa, Ryazan', Kirovsk, and Strelitsmak indicated complex adverse relationships between pollution sources (such as chemical plants, motor vehicle traffic, power plants, etc.), pointing up the need for greater comprehensive efforts directed toward more prompt enactment of abatement measures.

APTIC-23129

PREVENTION OF AIR POLLUTION BY EXHAUST FUMES.

(Haen ai yoru taiki oson boishi ai tsuite). Text in Japanese. Japanese Society of Mechanical Engineers, Osaka (Japan), Kansai Branch, Japanese Society of Mechanical Engineers Seminar, 41st, Osaka, Japan, Jan. 28-29, 1970, 7p. Nobumitsu Morita.

Identifiers: *Sources, *SO₂ removal (combustion products), Education, Emission standards, Japan, Engine exhausts, Combustion products, Dusts, Coal, Natural gas, Fuel oils, Residual oils, Electroconductivity analyzers, Instrumentation, Ground level, Meteorology, Manganese compounds, Nitrogen, Carbon dioxide, Carbon monoxide, Sulfur oxides, Oxygen.

The average percentage emission rates for nitrogen, oxygen, carbon monoxide, carbon dioxide, nitric oxide, dusts, hydrocarbons, sulfur dioxide, and sulfur trioxide are given for the combustion in boilers of coal or heavy oil, combustion of natural gas, and automobile engine exhausts.

Various factors that contribute to the exact definition of air pollution are the distribution of the ground-surface concentration of each pollutant, the contribution of each pollution source to the ground-surface concentration, the relationship between the concentration distribution and meteorology, and the measurement methods and their accuracy. Some of these items are not easy to determine, as evidenced by the lack of measurement stations for NO, CO and hydrocarbons even in a well-equipped city such as Osaka. The accurate determination of contribution by each source is difficult, but is the most rewarding as in the case of Nishiyodogawa area of Osaka, where SO₂ was found to originate far more from other sources than from heavy oil combustion. Also, in measuring SO₂, the electroconductivity method that gives results 100-200% of the actual value should be used with circumspection, especially in relation to the environmental standards. In addition, it is necessary to pursue the strictly scientific understanding of air pollution rather than misleading scientific beliefs. For example, there is a widespread belief that SO₂ pollution, air pollution and industrial pollution are equivalent and thus SO₂ is the single culprit of all health hazards. Such ideas must be altered. Various SO₂ removal methods are discussed including the use of porous manganese ores found on ocean floors in abundance.

APTIC-23160

THE ENGINEERING APPROACH TO AIR POLLUTION.

Preprint, American Public Health Assoc., New York, 22p., 1951, 41 refs. (Presented at the American Public Health Association Meeting, San Francisco, Calif., Nov. 2, 1951.)

Hannett P. Munger.

Identifiers: *Measurement methods, *Control equipment, Plant damage, Health impairment, Combustion gases, Particulates, Fly ash, Smokes, Particle size, Sampling methods, Collectors, Electrostatic precipitators, Venturi scrubbers, Dispersion.

In considering air pollution, there are at least two approaches: one is from the standpoint of medicine and relates to the public health of the community; the other is the engineering approach and is concerned with the measurement of contaminant concentrations and methods which may be used for reducing these concentrations. The present trend is to define air pollution on the basis of its effects. One effect is injury to property, including crops and other vegetation; another is injury to health; and the last is the nuisance factor, involving human comfort and convenience. Effects of weather and topography are an important part of air pollution studies. Smoke may be prevented or reduced by providing sufficient air, time, turbulence, and a high enough temperature for complete combustion. Mechanical collectors and electrostatic precipitators are most frequently used to separate fly-ash from combustion gases. The larger particles, above 10 micron, have a strong tendency to settle to the ground; smaller particles, below 1 micron, behave like aerosols and have little tendency to settle; gases, such as sulfur dioxide, diffuse in all directions. Dirt-fall collectors are discussed, as well as sampling methods for aerosols and gases. Dispersion of contaminants is reviewed. The latest improvements in collecting equipment have been in the newly designed

mechanical separators, both wet and dry, and the venturi scrubber.

APTIC-23229

THE APPLICATION OF AIR POLLUTION RESEARCH TO POWER STATION DESIGN.

Phil. Trans. Roy. Soc. London, Ser. A, 265 (1161):269-272, Nov. 13, 1969.

A. J. Clarke.

Identifiers: *Research programs, *Electric power production, *Design criteria, Great Britain, Stack gases, Dusts, Smokes, Stacks, SO₂ removal (combustion products), Dispersion, Plume behavior.

The objective of research on power station emissions is defined as finding more effective, more reliable, or less costly ways of either reducing the rate or increasing the height at which potential pollutants are emitted to the atmosphere. Research problems in smoke and dust emission have been mainly practical ones dealing with improved design in available hardware, although the development of basic theory has progressed in parallel. Main interest now centers on gaseous pollutants, characterized by sulfur dioxide, where control is at present almost wholly achieved by high level dispersion. An important research result has been the dependence of plume rise on the heat content of the emission; for a given generating capacity, plume rise can therefore be maximized by concentrating all the flue gases into a single chimney. Thus, despite some engineering problems, nearly all new power stations planned since 1960 are provided with a single chimney. The large body of data collected from air pollution monitoring programs has been of great utility in developing effective control measures. Practical design of new power stations must take into account numerous factors besides the results of research, but research has contributed greatly to the relative 'cleanliness' of the modern power plant.

APTIC-23237

AIR POLLUTION IN APPALACHIA: AIR POLLUTION AND PLANT LOCATION.

Appalachia, 3 (9):1-3, June-July 1970.

Charles L. Hoeller.

Identifiers: *Appalachia, *Planning and zoning, *Industrial emission sources, *Topographic interactions, Industrial areas, Valleys, Stack gases, Stacks, Lower atmosphere, Dispersion, Plume behavior, Inversion, Topographic interactions.

The ridge-and-valley topography of parts of Appalachia produces strong night-time inversions and limits horizontal dispersion of polluted air. The traditional location of Appalachian industry in the flat valley bottoms, because of cheaper construction and available canals, roads, and railways, exacerbates pollution problems, since each valley becomes filled with cold polluted air which cannot rise and mix or spread out. Detailed meteorological studies are required to indicate which locations are most favorable to an effective dispersion of pollutants, without simply passing the polluted air on to neighboring communities. Tall stacks can also be a most effective solution, but only if they furnish genuine vertical dispersion by carrying pollutants to higher levels of the atmosphere where they are removed by natural processes, rather than transferring them downwind.

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